TM 5-6115-413-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

115 ORD

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT, AND DEPOT MAINTENANCE MANUAL

GENERATOR SET: 7.5 KW, 28 V DC, TWO-WIRE, AIR COOLED, GASOLINE ENGINE, WHEEL MOUNTED (BENDIX MODEL 59B2-1-A) FSN 6115-903-4948 AND (BENDIX MODEL 59B2-1-B) FSN 6115-926-8335

COMMANDING OFFICER
115th HV EQUIP MAINT CO (GS)(A)
RFD #1, CAMP W. G. WILLIAMS
RIVERTON, UTAH 84065

HEADQUARTERS, DEPARTMENT OF THE ARMY

JANUARY 1967

SAFETY PRECAUTIONS

BEFORE OPERATION

Never operate the generator set indoors without providing leakproof piping to vent the exhaust fumes to outside of the building. The exhaust fumes contain carbon monoxide, a colorless, odorless, deadly poisonous gas.

Do not smoke or use an open flame in the area when servicing the generator set. Note that batteries generate hydrogen, a highly explosive gas.

When filling the fuel tank, always maintain metal-to-metal contact between filling apparatus and fuel tank to prevent a spark from being caused by static electricity.

DURING OPERATION

To prevent burns, avoid touching the muffler during operation. Do not fill fuel tank while engine is running. Set MAGNETO switch to STOP. Do not attempt to change any electrical connections or perform maintenance on the generator set while it is in operation. The voltage generated can cause serious injury or death by electrocution.

AFTER OPERATION

Never fill fuel tank when engine is hot, to avoid possibility of spilled fuel causing a fire.

When filling the fuel tank, always maintain metal-to-metal contact between filling apparatus and fuel tank to prevent a spark from being caused by static electricity.

When unscrewing filler cap on fuel tank, keep face and eyes turned away from fuel tank. Fuel expands greatly when heated or agitated, and may be discharged from tank when cap is removed.

Remove ignition cables from spark plugs or set MAGNETO switch to STOP when servicing the engine. If this is not done, turning the engine by hand during servicing can start the engine and cause serious injury.

TECHNICAL MANUAL
No. 5–6115–413–15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *31 January 1967*

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT, AND DEPOT MAINTENANCE MANUAL

GENERATOR SET: 7.5 KW, 28 V DC, TWO-WIRE, AIR COOLED, GASOLINE ENGINE, WHEEL MOUNTED (BENDIX MODEL 59B2—1—A) FSN 6115—903—4948 AND (BENDIX MODEL 59B2—1—B) FSN 6115—926—8335

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1–1. Scope

a. These instructions are published for use by personnel to whom the Bendix Models 59B2–1–A and 59B2–1–B generator sets are issued. Chapters 1 through 3 provide information on operation, preventive maintenance services, and organizational maintenance of equipment, accessories, components, and attachments. Chapters 4 through 6 provide information for direct and general support and depot maintenance. Also included are descriptions of main units and their functions in relationship to other components.

b. Appendix A contains a list of publications applicable to this manual. Appendix B contains the list of basic issue items authorized the operator of this equipment, and the list of maintenance and operating supplies required for initial operation. Appendix C contains the maintenance allocation chart. Organizational, direct and general support, and depot maintenance repair parts and special tools are listed in TM 5–6115–413–15P.

c. Numbers in parenthesis following nomenclature callouts on illustrations indicate quantity; numbers preceding nomenclature callouts indicate preferred sequence.

d. Direct reporting of errors, omissions and recommendations for improving this equipment manual by the individual user is authorized and encouraged. Prepare DA Form 2028 (Recommended changes to DA Publications) for this purpose, using pencil, pen, or typewriter, and forward direct to Commanding General, U. S. Army Mobility Equipment Command, ATTN: SMOME-MPD, 4300 Goodfellow Blvd., St. Louis, Mo. 63120.

1–2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

b. For other record and report forms applicable to operator, crew, and organizational maintenance, refer to TM 38–750.

Note. Applicable forms, excluding Standard Form 46 (United States Government motor vehicle identification card) which is carried by the operator, shall be kept in a canvas bag mounted on equipment.

Section II. DESCRIPTION AND TABULATED DATA

1–3. Description

a. Engine. The Wisconsin Motors engine Model MVH4D is a 107.7 cubic-inch displacement, four-cylinder, air-cooled, four-cycle engine which is governed at a speed of 2800 rpm (revolutions per minute) (figs. 1–1 through 1–4).

b. Starter Generator. The Bendix Model 30B37–37–A dc starter generator is driven by a pulley and fan belt coupling from the engine. The generator produces 28 volts dc at 7.5kw (kilowatts).

1–4. Identification and Tabulated Data

a. Identification. The Bendix Models 59B2–1–A and 59B2–1–B generator sets have two major identification plates. The information contained on the plates is listed below.

(1) *Generator set plate.*

U. S. Army
Generator Set—Gasoline Engine
Stock No. __FSN 6115–903–4948 (for model 59B2–1–A)
FSN 6115–926–8335 (for model 59B2–1–B)

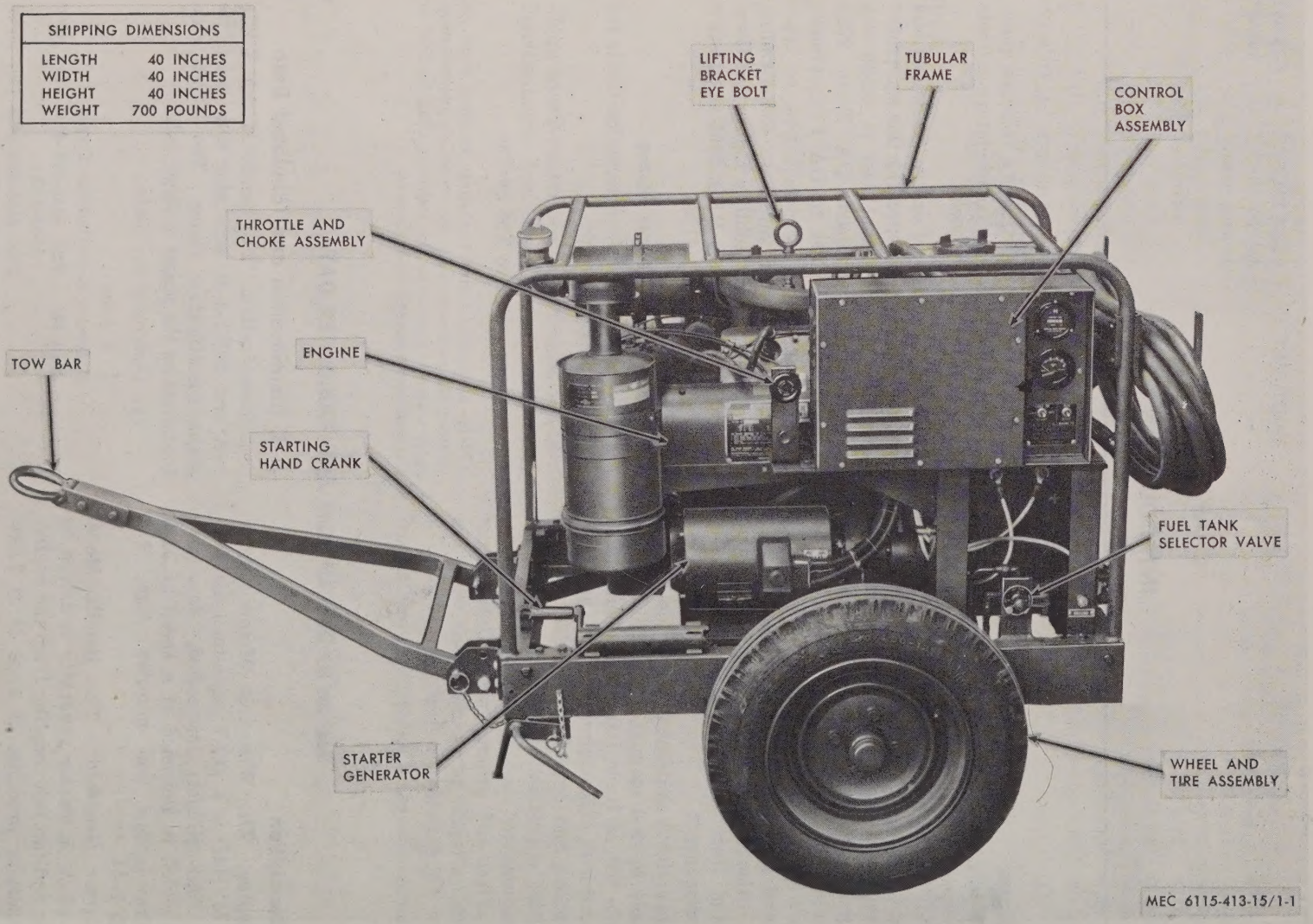


Figure 1–1. Generator set, left-side view with shipping dimensions

TM 5–6115–413–15
Mfr ____The Bendix Corporation
Model ____59B2–1–A (59B2–1–B)
Volts ____28DC
Amps ____270
KW ____7.5
RPM ____2800

Contr No. _DA–23–195–AMC–00767(T)
Lg ____40″
Width ____40″
Hgt ____40″
Wt ____700 Lbs
Eng Mfr __Wisconsin Motors
Model ____MVH4D

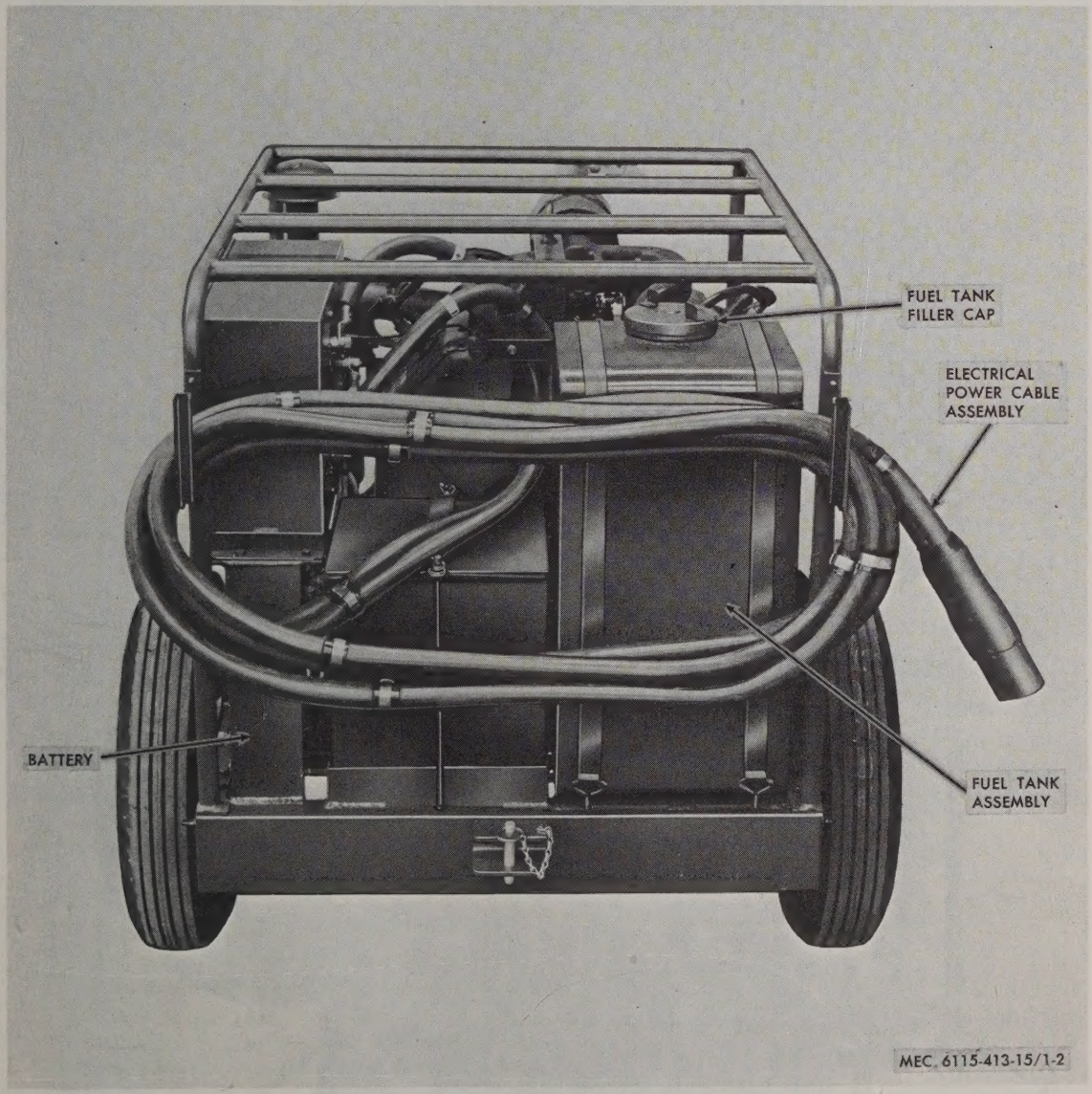


Figure 1–2. Generator set, rear view.

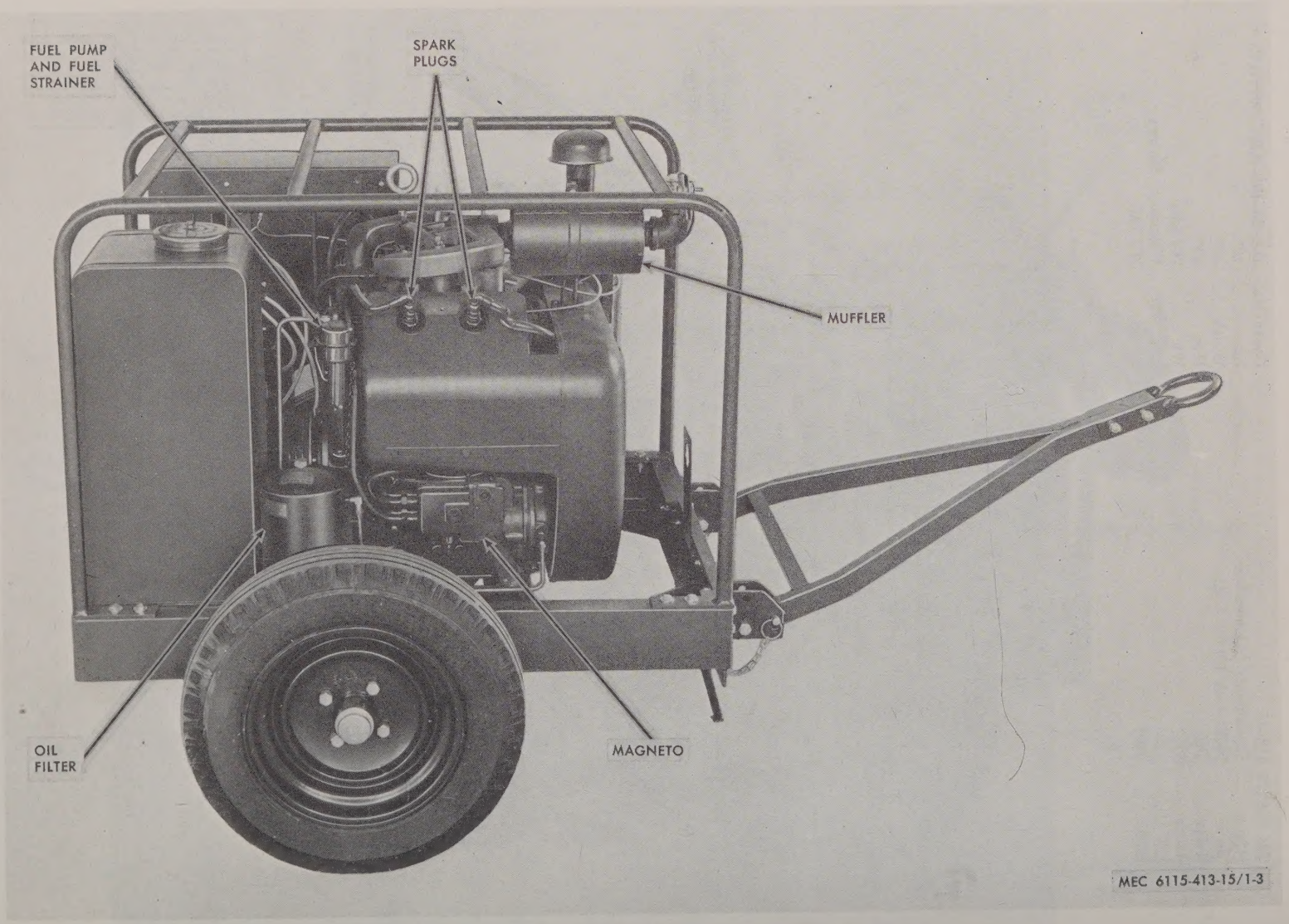


Figure 1–3. Generator set, right-side view.

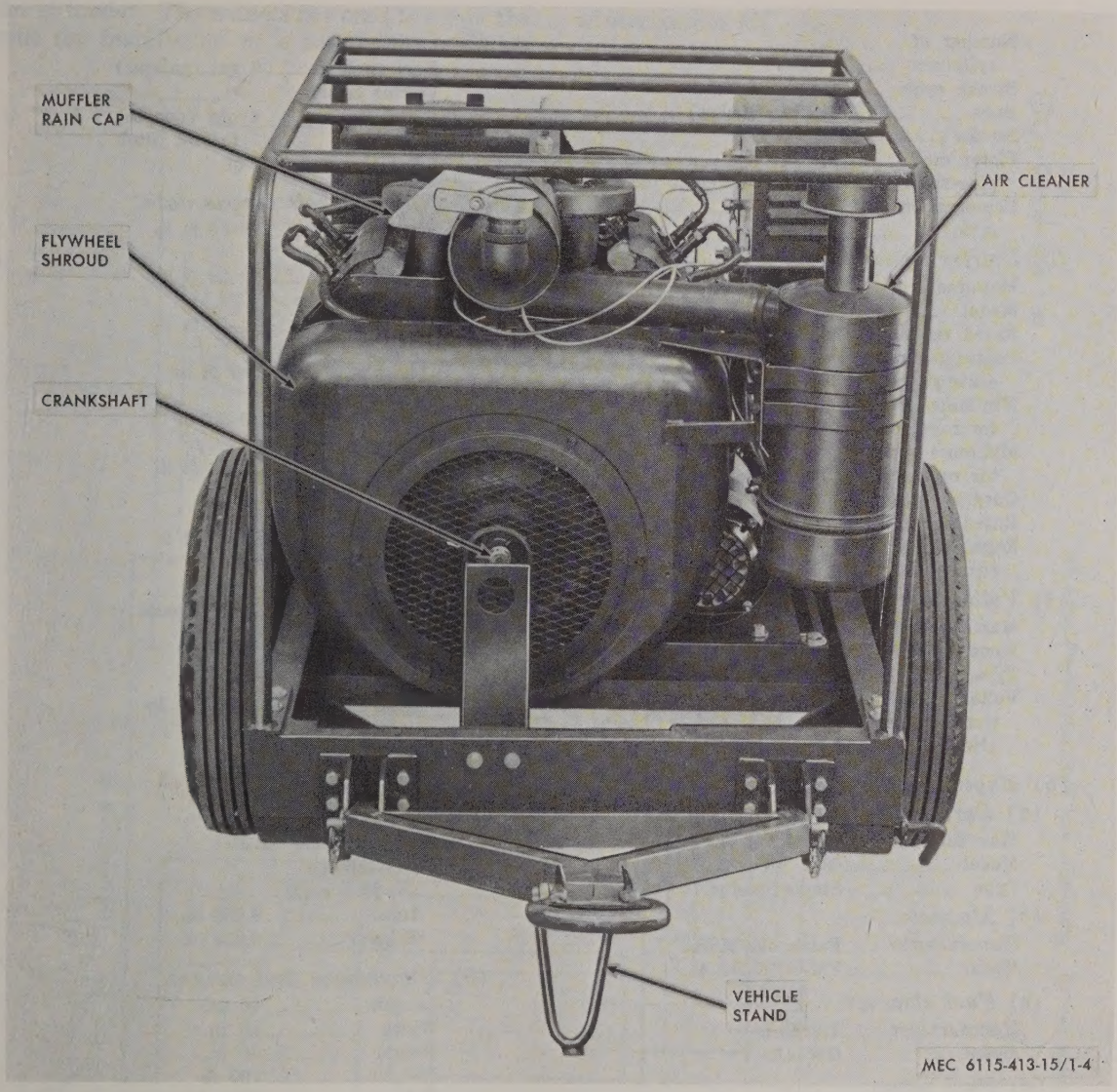


Figure 1–4. Generator set, front view.

(2) *Starter generator plate.*

The Bendix Corporation, Red Bank Division
D.C. Starter Generator
Amps ---------- 300
Volts ---------- 30
Mfr's Part No. ---------- 30B37–37
Style ---------- A
RPM ---------- 4500/8000
Contract or Order No. -- DA–23–195–AMC–00767(T)

b. Tabulated Data.

(1) *Generator set.*

Manufacturer ---- Bendix
Model ---------- 59B2–1–A (or 59B2–1–B)
Type ---------- Gasoline engine

(2) *Engine.*

Manufacturer ---- Wisconsin Motors
Type ---------- Air-cooled
Model ---------- MVH4D
Specification ---- 283530 (MIL–E–11275D)

Number of cylinders ____4
Stroke cycle ____4
Bore ____3¼ in. (inches)
Stroke ____3¼ in.
Piston displacement ____107.7 cu in. (cubic inches)
Compression ratio ____5.5:1

(3) *Starter generator.*
Manufacturer ____Bendix
Model ____30B37–37–A
Rated speed ____5000 rpm
Continuous operating speed ____6500 rpm
Minimum speed for regulation ____5000 rpm
Minimum speed for regulation ____10,000 rpm
Output voltage ____30v (volts)
Rated current ____300 amp (amperes)
Regulated field current ____8 amp max (maximum)

(4) *Voltage regulator.*
Manufacturer ____Bendix
Model ____1589–1–F
Type ____Carbon pile
Voltage regulation tolerance (Hot) ____0.7v

(5) *Engine accessories.*

(*a*) *Carburetor.*
Manufacturer ____Zenith
Model ____68–7
Type ____Single venturi

(*b*) *Magneto.*
Manufacturer ____Fairbanks-Morse
Model ____FM–XZE4B7–4

(*c*) *Fuel strainer.*
Manufacturer ____Tillotson
Model ____OW–418–T

(*d*) *Fuel pump.*
Manufacturer ____Wisconsin Motors
Model ____LP–38–C
Type ____Cold-weather operation

(*e*) *Air cleaner.*
Manufacturer ____Donaldson
Model ____KAX00–0354
Specification ____MS35875–3

(*f*) *Oil filter.*
Manufacturer ____Fram
Model ____F21–P
Specification ____F–F–351, Type 1, Class 2

(*g*) *Spark plug.*
Manufacturer ____Champion
Model ____XMD–21
Size ____18 mm (millimeters)

(6) *Capacities.*
Fuel tank ____9 gal (gallons)
Engine crankcase ____4 qts (quarts) +1 qt for oil filter
Air cleaner ____1 qt

(7) *Nut and bolt torque data.*
Spark plug ____25–30 ft lb
Cylinder head screws ____22–24 ft lb
Gear cover cap screws ____14–18 ft lb
Oil pan mounting screws ____6–9 ft lb
Cylinder block mounting nuts ____40–50 ft lb
Connecting rod nuts ____22–24 ft lb
Main bearing plate cap screws ____25–30 ft lb
Carburetor manifold mounting nuts ____23 ft lb max
Starter generator terminal block mounting bolts ____35–40 in. lb

(8) *Adjustment data.*
Spark plug gap ____0.030 in.
Magneto breaker point gap ____0.015 in.
Spark advance ____23°
Valve tappets (engine cold):
Inlet ____0.008 in.
Exhaust ____0.016 in.

(9) *Dimensions and weight.*
Length ____40 in.
Width ____40 in.
Height ____40 in.
Weight ____700 lb
Volume ____37 cu ft

(10) *Wiring diagram* (fig. 1–5).

(11) *Base plan.* Although the generator set is self-mounted and requires no base plan illustration, figure 1–6 is included as a guide for locating the equipment.

1–5. Differences in Models

This manual covers the Bendix Models 59B2–1–A and 59B2–1–B generator sets. The units are identical with the exception that Model 59B2–1–B includes two air ducts (fig. 1–7) mounted over the left and right-hand side cylin-

der shrouds. These ducts are used to adapt the unit for installation of a separately available winterization kit.

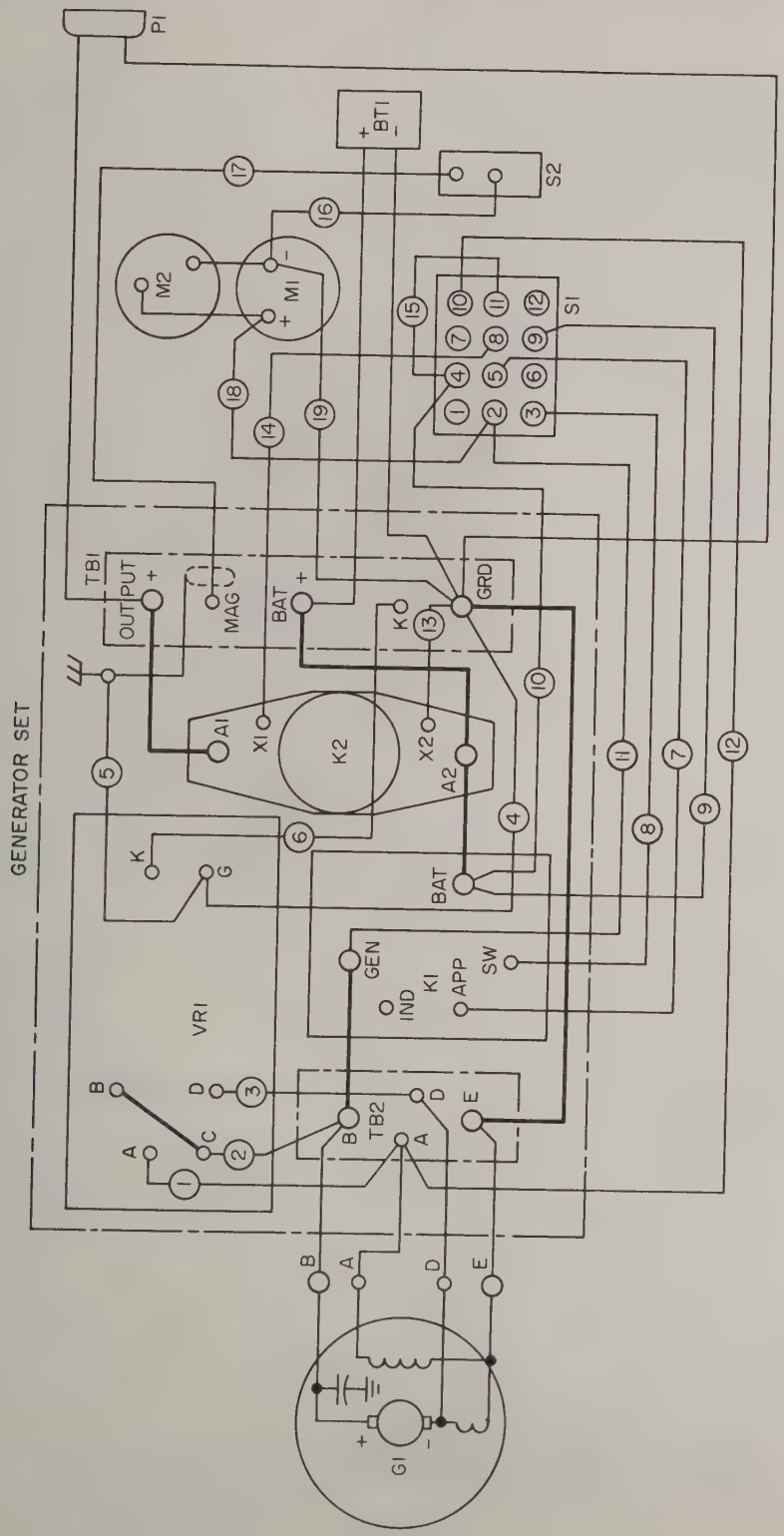
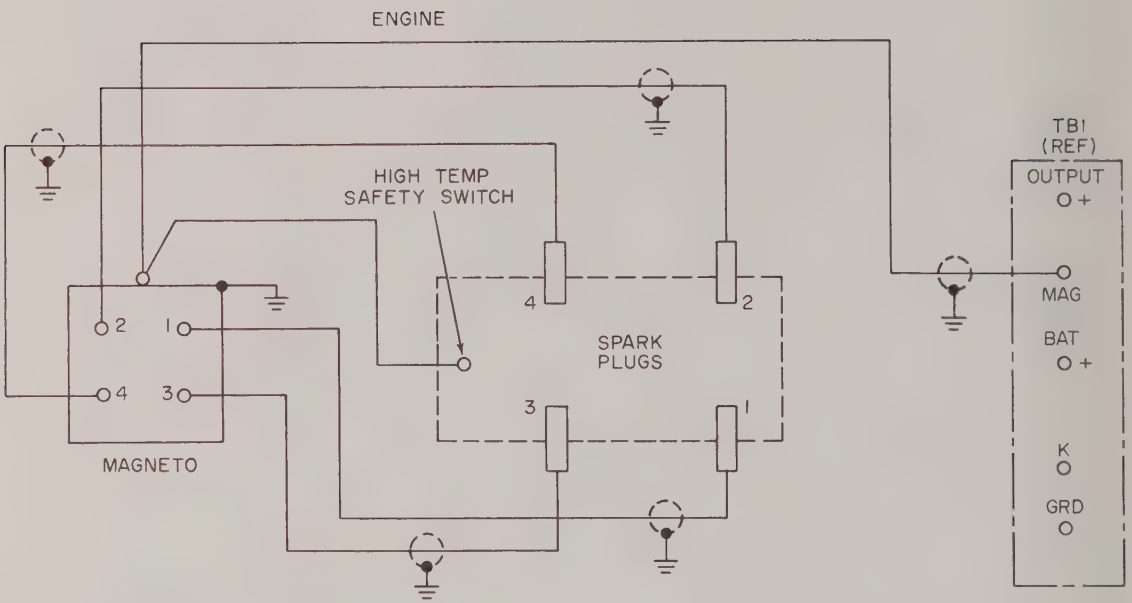


Figure 1–5 ①. Generator set, practical wiring diagram.



DEVICE LEGEND:

BTI	BATTERY
GI	STARTER GENERATOR
KI	CUTOUT RELAY
K2	RELAY
MI	VOLTMETER
M2	TIME TOTALIZING METER
PI	OUTPUT CONNECTOR
SI	LOAD SWITCH
S2	MAGNETO SWITCH
TBI	TERMINAL BOARD
TB2	TERMINAL BOARD
VRI	VOLTAGE REGULATOR

SYMBOL LEGEND:

SHIELDED LEAD

CAPACITOR

GROUND CONNECTION

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Figure 1–5 ②—Continued

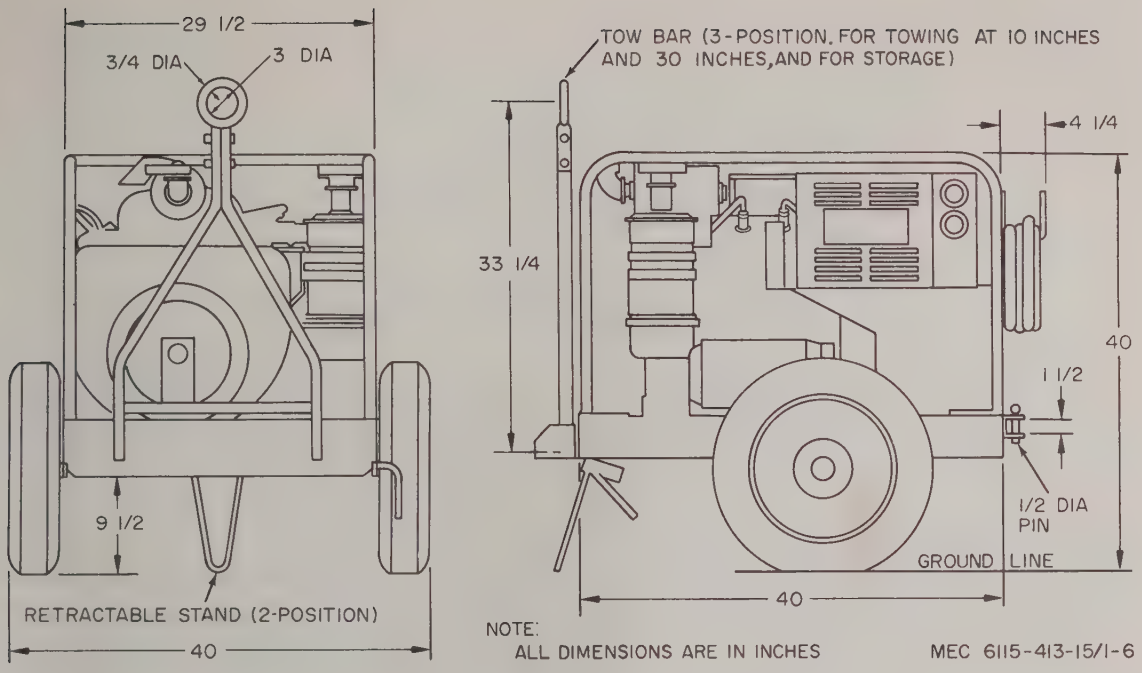


Figure 1–6. Generator set, outline drawing.

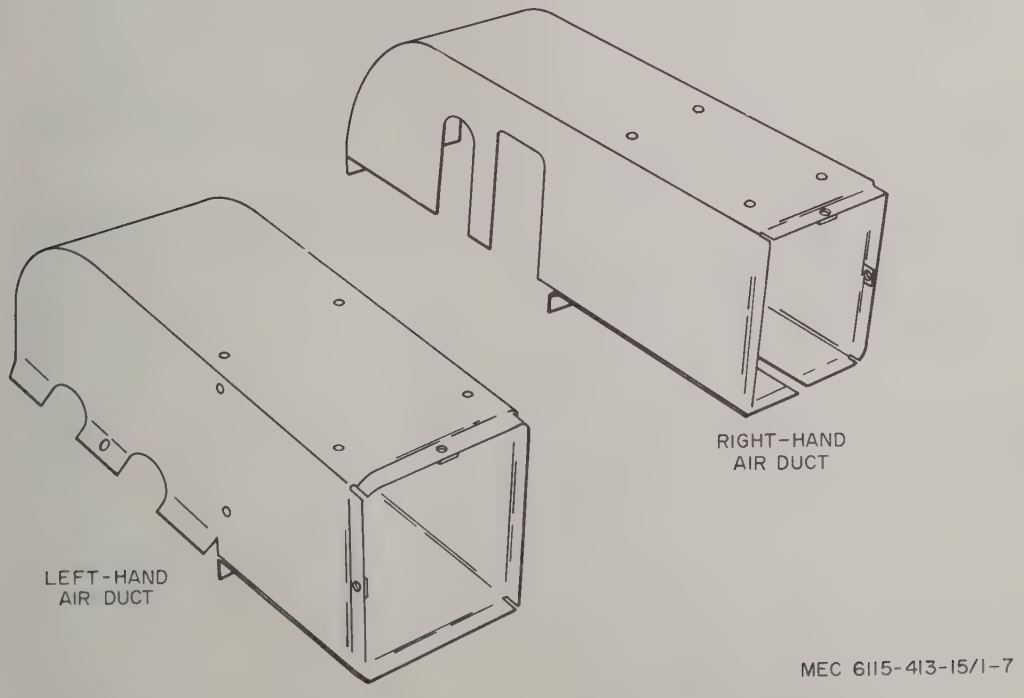


Figure 1–7. Air ducts (applicable to Model 59B2–1–B only)

CHAPTER 2

INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2–1. Unloading Equipment

The generator set is equipped with a lifting bracket eyebolt for crane handling (fig. 1–1). For truck handling, lift the vehicle stand and use the tow bar to secure the generator set to a trailer mount.

2–2. Unpacking Equipment

Remove the banding from the exterior shipping container. Use the lifting bracket eyebolt to lift the generator set from the shipping container.

2–3. Inspecting and Servicing Equipment

a. Remove the canvas generator set cover. Refer to the basic issue items list (Appendix B) to check for the presence of all required materials. Check all parts for insecure mounting. Tighten all loose mounting screws and caps.

b. Refer to paragraph 3–6 for daily preventive maintenance services to be performed.

c. Visually check the generator set for missing parts and for damage that may have occurred during shipment. Check for missing or damaged muffler, muffler rain cap, spark plugs, throttle and choke assembly, air cleaner, fuel tank, battery, starting hand crank, electrical power cable assembly, and flywheel shroud (figs. 1–1 through 1–4). Insert starting hand crank over the crankshaft and turn the engine over (one or two revolutions) to check for free rotation of the engine. Listen for any unusual noises which may be caused by damaged engine components.

d. Check battery for fluid level and test in accordance with TM 9–6140–200–15.

2–4. Installation of Separately Packed Components

Since the generator set is shipped completely assembled, no installation is required.

2–5. Installation or Setting up Instructions

a. Location. The generator set is designed to be operated in its normal condition; that is, supported by the wheel and tire assemblies and the vehicle stand (in its forward-most position). Provide shelter for operation during inclement weather. Position the generator set to allow adequate air circulation and make sure that the exhaust fumes are directed away from the operator (in windy weather, position the front or muffler end of the equipment in a downwind direction).

b. Indoor Installation. If the generator set is to be installed indoors, use 2-in. ID flexible exhaust tubing to vent the exhaust fumes out of the building. Keep the tubing as short and straight as possible. Make sure all exhaust connections are tight and that the room is well ventilated. Provide adequate air ventilation around the generator set to prevent overheating. Observe the additional requirements of *a* above.

Warning: **Do not operate the generator set in an enclosed area unless exhaust gases are piped to the outside. Inhalation of exhaust fumes will result in serious illness or death.**

c. Adding Oil.

(1) Before attempting operation, check the oil level in the engine crankcase by removing the oil gage saber ("dipstick").

(2) If necessary, add enough oil (fig. 2–1) to bring the level up to the FULL

mark. Use MIL–L–2104 oil, Grade OE30 for temperatures above 40°F, or OE10 for temperatures between −10°F and 40°F.

Note. For temperatures below −10° F, refer to paragraph 2–14.

(3) If the engine is new or the crankcase is empty, add 5 quarts of oil (4 quarts for the crankcase and 1 quart for the oil filter).

d. Using Auxiliary Fuel Tank.

Note. The generator set is provided with a three-position fuel tank selector valve (fig. 1–1). When the valve handle is positioned to the left (OFF), no fuel is supplied to the system. When the valve handle is vertical (SET TANK), the integral fuel tank is connected. When the valve handle is positioned to the right (AUXILIARY), an auxiliary fuel tank can be connected for longer duration operation.

(1) Set fuel tank selector valve handle to OFF.

(2) Using an 11/16 inch wrench, loosen and remove the cap fitting on the lower right side of the valve. Retain the cap fitting for installation when use of the auxiliary fuel tank is completed.

(3) Connect the auxiliary fuel line to the ½–20 threaded male connection on the valve elbow fitting.

(4) Set fuel tank selector valve handle to AUXILIARY.

e. Using Integral Fuel Tank.

(1) Set fuel tank selector valve handle to OFF.

(2) Remove fuel tank filler cap (fig. 1–2).

(3) Check that MAGNETO switch on con-

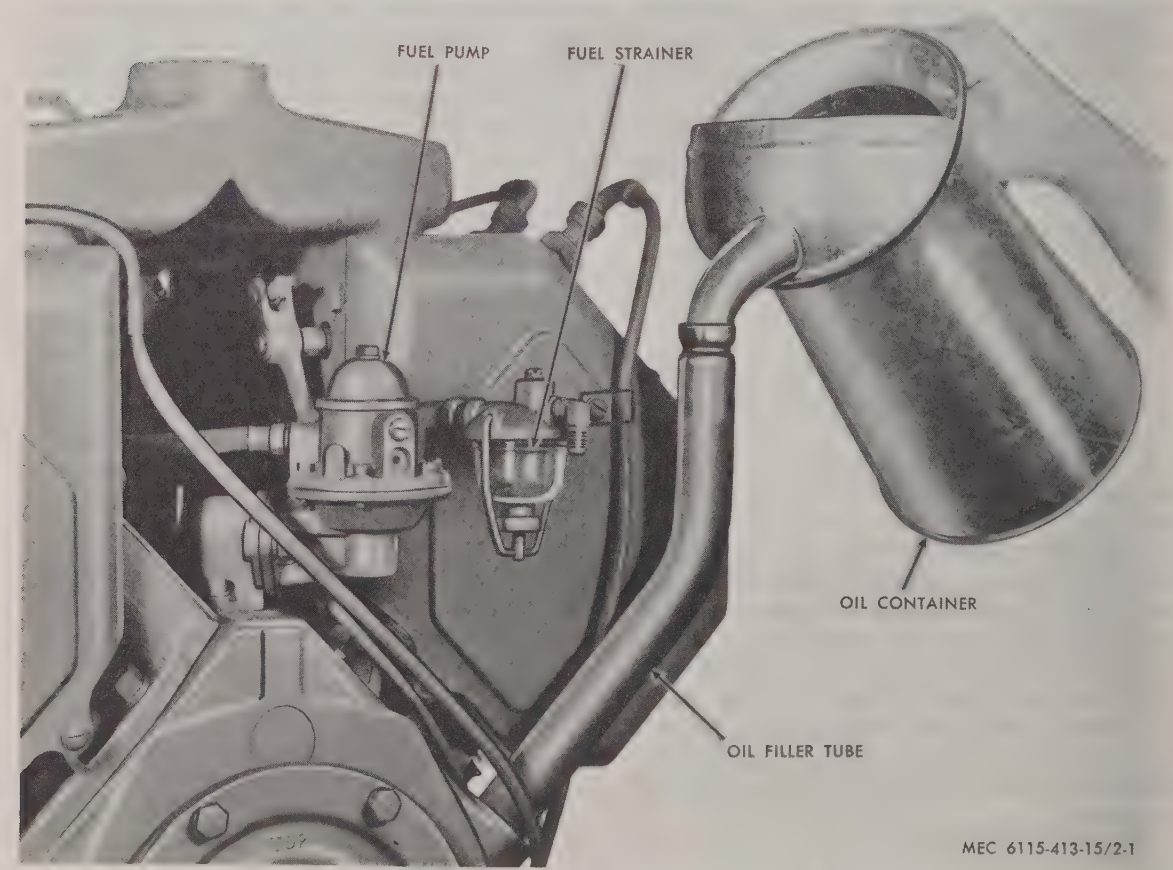


Figure 2–1. Adding oil to crankcase

trol box assembly is set to STOP.

(4) Fill the fuel tank with 9 gallons of automotive combat (91A) gasoline.

Caution: **Make sure the gasoline is free from dirt and water.**

(5) Set fuel tank filler cap valve to the open position before installing the cap.

(6) Set fuel tank selector valve to SET TANK.

Warning: **Wipe up any spilled fuel immediately. Keep the generator set clean and dry.**

Section II. MOVEMENT TO NEW WORKSITE

2–6. Dismantling for Movement

a. If the generator set is to be towed by truck for short distances, it is permissible to move the equipment while fuel remains in the tank. Disconnect the auxiliary fuel line (if used), position the fuel tank selector valve handle to the left, and make sure the fuel tank cap is securely tightened.

b. If the generator set is to be transported by rail, or for long distances, drain the fuel tank before shipment. The best method for complete drainage is to remove the fuel tank cap and disconnect the fuel line from the elbow fitting directly under the fuel tank. Then, if time permits, run the unit until it stops. This will provide complete drainage, which cannot be achieved any other way.

2–7. Reinstallation after Movement

Refer to paragraph 2–5 for reinstallation procedures.

Section III. CONTROLS AND INSTRUMENTS

2–8. General

This section describes, locates, illustrates, and furnishes operator, crew, or organizational maintenance personnel sufficient information about various controls and instruments for proper operation of the generator set.

2–9. Controls and Instruments

The purpose of controls and instruments and their normal and maximum readings are illustrated in figure 2–2.

Section IV. OPERATION OF EQUIPMENT

2–10. General

a. Instructions in this section are published for information and guidance of personnel responsible for operation of the generator set.

b. The operator must know how to perform every operation of which the generator set is capable. This section gives instructions on starting and stopping the generator set, basic motions of the generator set, and on coordinating basic motions to perform specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

2–11. Starting

a. Preparation for Starting.

(1) Perform necessary daily preventive maintenance services, paragraph 3–6.

(2) Fill fuel tank (para 2–5*e*) and set fuel tank selector valve handle to SET TANK, or connect auxiliary fuel tank to the fuel tank selector valve (para 2–5*d*) and set the valve handle to AUXILIARY (fig. 2–2).

Note. If generator set integral fuel tank is used, make sure fuel tank cap valve is in open position.

(3) Be sure load is not applied by setting

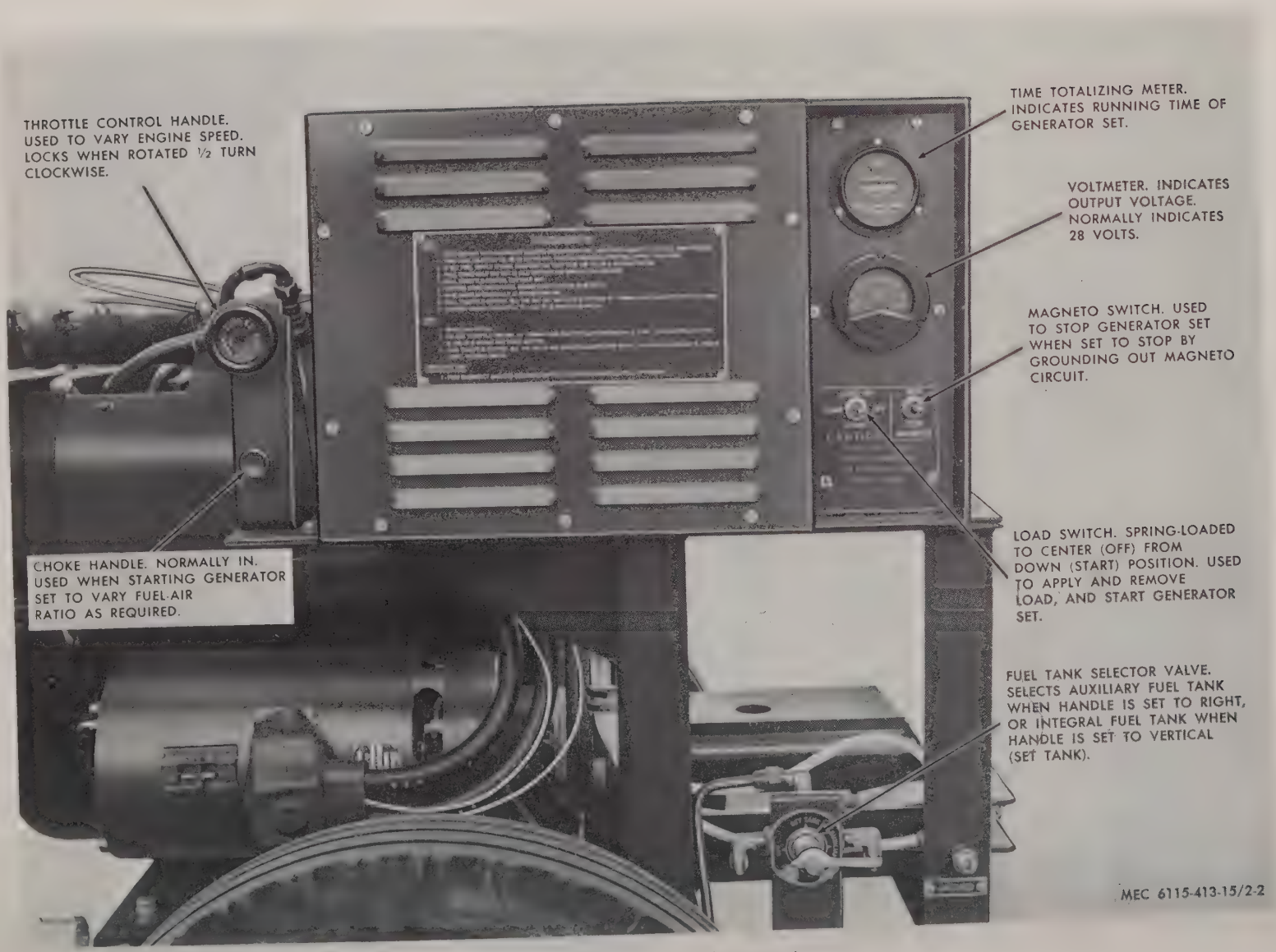

THROTTLE CONTROL HANDLE. USED TO VARY ENGINE SPEED. LOCKS WHEN ROTATED ½ TURN CLOCKWISE.
TIME TOTALIZING METER. INDICATES RUNNING TIME OF GENERATOR SET.
VOLTMETER. INDICATES OUTPUT VOLTAGE. NORMALLY INDICATES 28 VOLTS.
MAGNETO SWITCH. USED TO STOP GENERATOR SET WHEN SET TO STOP BY GROUNDING OUT MAGNETO CIRCUIT.
CHOKE HANDLE. NORMALLY IN. USED WHEN STARTING GENERATOR SET TO VARY FUEL-AIR RATIO AS REQUIRED.
LOAD SWITCH. SPRING-LOADED TO CENTER (OFF) FROM DOWN (START) POSITION. USED TO APPLY AND REMOVE LOAD, AND START GENERATOR SET.
FUEL TANK SELECTOR VALVE. SELECTS AUXILIARY FUEL TANK WHEN HANDLE IS SET TO RIGHT, OR INTEGRAL FUEL TANK WHEN HANDLE IS SET TO VERTICAL (SET TANK).
MEC 6115-413-15/2-2

Figure 2–2. Controls and instruments

load switch to LOAD OFF (fig. 2–2). Make sure magneto ground switch (fig. 3–7) is pulled fully outward (down).

b. Starting.

(1) Set MAGNETO switch (fig. 2–2) to RUN.

(2) If engine is cold, pull choke handle (fig. 2–2) fully outward. If engine is warm, little or no choking should be required.

(3) Pull throttle control handle approximately half-way out and rotate ½ turn clockwise until it locks in position.

(4) Press load switch down to START position, and hold until engine starts. The switch is spring-loaded and will return to the center position when released.

(5) As the engine warms up, push choke handle in gradually for smooth operation. The engine should normally start within two to three crankshaft revolutions. If starting difficulty is encountered, use short cranking cycles rather than holding the switch down for long periods of time.

Note. Immediately after engine maintenance has been performed, or if the engine is new, fuel pump hand-priming may be required (fig. 2–3). If distinct resistance is not felt when priming, turn engine over approximately one revolution to reposition fuel pump cam, and prime the lever 20 to 30 strokes before restarting.

(6) If the engine floods, push choke handle fully inward and try again.

(7) As the engine warms up, push choke handle fully inward for normal operation.

Caution: **Do not attempt to hasten warm-up time by racing the engine in cold weather. This could cause premature wear on polished wearing surfaces.**

(8) Unlock throttle control handle, pull fully outward, and lock by rotating ½ turn clockwise.

(9) Set load switch to LOAD ON. Make sure engine is warmed up before load is applied.

2–12. Stopping

a. Disconnect load by setting load switch to LOAD OFF (fig. 2–2).

b. Unlock throttle control handle and push half-way in to allow engine to idle for approximately three minutes.

c. Push throttle control handle fully inward.

d. Set MAGNETO switch (fig. 2–2) to STOP, and hold in position until the engine stops.

Note. For emergency stopping, push magneto ground switch (fig. 3–7) fully inward (up).

2–13. Operation Under Usual Conditions

a. Start the engine as described in paragraph 2–11.

b. Allow the engine to warm up before applying load.

c. The engine governor will automatically control the engine speed by varying the throttle opening. No manual control is required.

d. Stop the engine as described in paragraph 2–12.

2–14. Operation in Extreme Cold (Below −10°F)

a. Use model 59B2–1–B with winterization kit, if available.

b. Keep fuel tank full at all times to prevent moisture condensation. Keep fuel tank cap securely closed.

c. Use MIL–L–10295 oil, grade OES in the crankcase, for easier starting at temperatures below −10°F.

d. Allow the engine to run at about 2/3 full throttle (1800 rpm) for a minimum of 10 minutes.

e. Increase engine speed to full throttle (2800 rpm) for 5 minutes before applying the load.

f. Keep battery fully charged. After adding water to battery, run engine for at least one hour.

2–15. Operation in Extreme Heat

a. Check the tooling fins on the cylinder and head frequently to be sure they are clean and not damaged.

b. If possible, operate at less than full rated load. This will minimize danger of overheating.

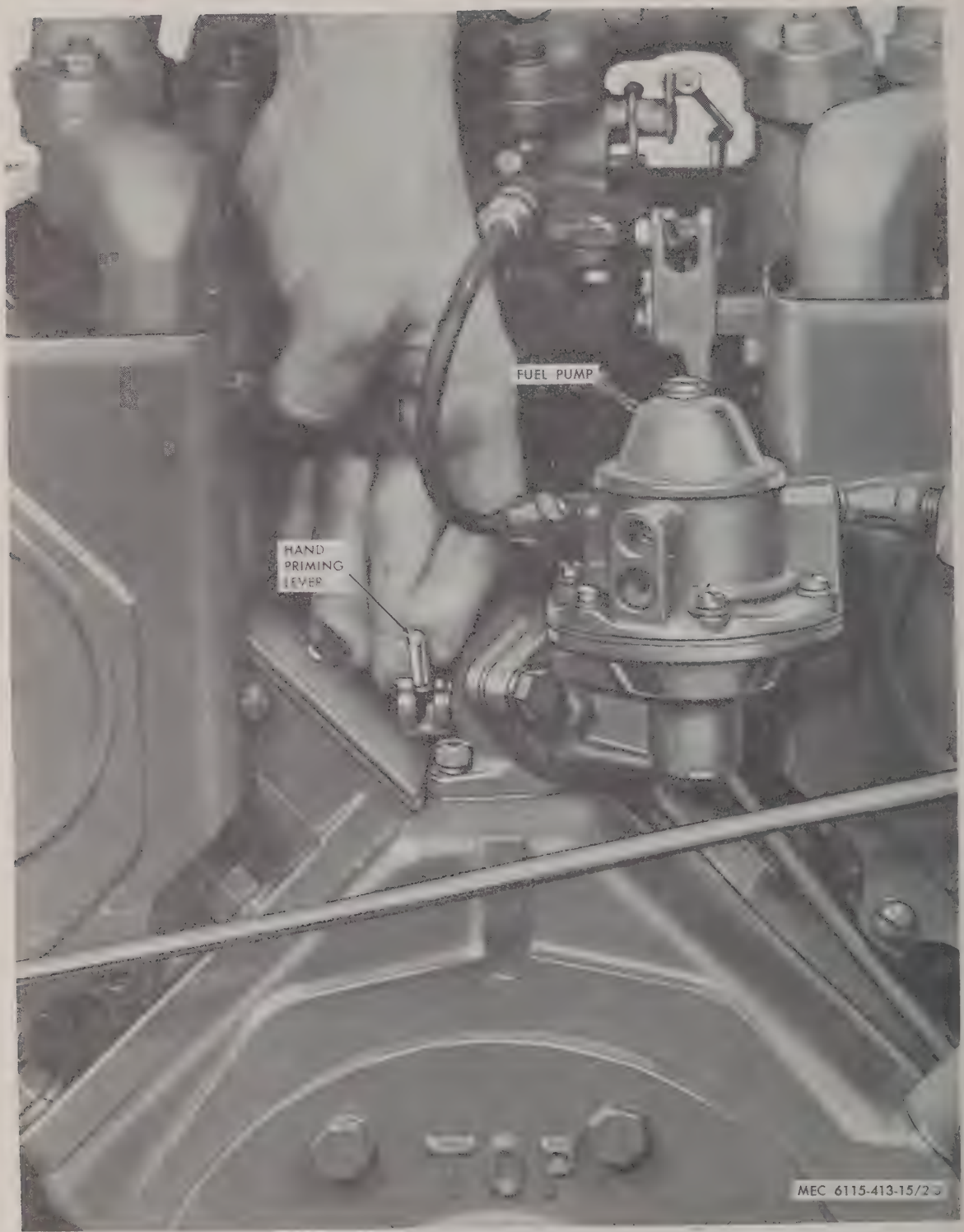


Figure 2–3. Priming fuel pump

c. Provide shade to protect the unit from direct rays of the sun.

d. Make sure that cooling air circulation is not restricted.

2–16. Operation in Dusty or Sandy Areas

a. Shield the unit from dust. Take advantage of natural barriers which offer protection from blowing sand and dust. When not in operation, install the canvas generator set cover over the unit.

b. Strain the fuel before adding it to the fuel tank. Make sure pouring vessels are clean.

c. Check air cleaner frequently. Make sure oil in air cleaner is not dirty, as this condition will considerably shorten service life.

d. Clean the generator set frequently. Wipe with a cloth dampened with an approved cleaning solvent.

2–17. Operation under Rainy or Humid Conditions

a. When the generator set is not in operation, keep it in a sheltered area.

b. Keep fuel tank full at all times to prevent moisture condensation.

2–18. Operation in Salt Water Areas

a. Avoid contact with salt water as corrosion can occur. If the generator set comes in contact with salt water, wash with fresh water.

b. Paint exposed metallic surfaces if paint has been chipped off or otherwise removed. Coat exposed ferrous metal surfaces with standard issue rustproofing material if available, or cover parts with a light film of grease.

2–19. Operation at High Altitudes

a. Engine power output will decrease at a rate of 3½ percent for each 1000-foot increase in elevation above sea level. The generator output will decrease accordingly as engine output decreases.

b. Maintain maximum performance by following all service instructions carefully. Be sure the oil in the air cleaner is not dirty.

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

3–1. Special Tools and Equipment

No special tools or equipment are required by operator or organizational maintenance personnel for maintenance of the generator set.

3–2. Basic Issue Tools and Equipment

Repair parts issued with or authorized for use with the generator set are listed in the basic issue items list, Appendix B of this manual.

Section II. LUBRICATION

3–3. General Lubrication Information

a. This section contains a reproduction of the lubrication order and lubrication instructions which are supplemental to, and not specifically covered in the lubrication order.

b. The lubrication order shown in figure 3–1 is an exact reproduction of the approved lubrication order for the generator set. For the current lubrication order, refer to DA Pamphlet 310–4.

3–4. Detailed Lubrication Information

a. General. Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Do not allow any dust, dirt, or other foreign matter to come in contact with the lubricants. Keep all lubrication equipment clean and ready for use.

b. Cleaning. Keep all external parts that do not require lubrication free of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

c. Points of Lubrication. Service the lubrication points at proper intervals as illustrated in figure 3–1.

d. OES Oil.

(1) When using grade OES oil in the crankcase (under conditions of extreme cold), check the oil level frequently, as oil consumption may increase.

(2) This oil may require changing more frequently than usual because contamination by dilution and sludge formation will increase under cold weather operation conditions.

e. Oil Filter Service. Refer to figure 3–2 and service the oil filter.

f. Air Cleaner Service. Refer to figure 3–3 and service the air cleaner.

Section III. PREVENTIVE MAINTENANCE SERVICES

3–5. General

To insure that the generator set is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services to be performed are listed and described in paragraphs 3–6 and 3–7. Item numbers indicate the sequence of minimum inspection requirements. Defects

LUBRICATION CHART

GENERATOR SET, GASOLINE ENGINE: 7.5 KW, DC, 28 V; TWO-WIRE; AIR COOLED; WHEEL MOUNTED (BENDIX MODELS 59B2-1-A AND 59B2-1-B) W/WISCONSIN ENGINE MODEL MVH4D

Intervals are based on normal hours of operation. Reduce to compensate for abnormal operation and severe conditions. During inactive periods sufficient lubrication must be performed for adequate preservation.

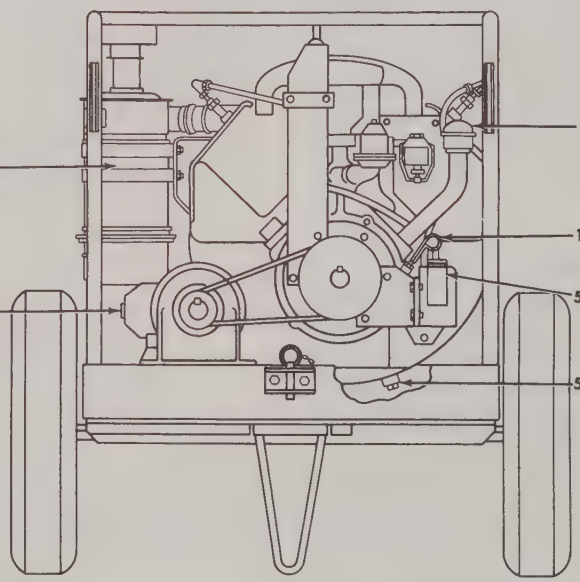
Clean fittings before lubricating.

Relubricate after washing or fording.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Drain crankcase when hot. Fill and check level.

LUBRICANT • INTERVAL **INTERVAL • LUBRICANT**


Air Cleaner (Refill Bowl to Level Mark) OE 10
Starter Generator (Sealed Bearings; No Lubrication Required)
10 OE Oil Filler (See Key)
10 OE Oil Saber (Check Level)
50 Oil Filter (See Note 3)
50 Crankcase Oil Drain Plug (Remove Plug, Drain, and Refill)

MEC 6115-413-15/3-1①

Figure 3–1 ①. Lubrication chart

LUBRICATION CHART (Cont.)

KEY

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F	+40°F to -10°F	0°F to -65°F	
OE-OIL, Engine, Heavy Duty		**OE30**	**OE10**	**OES**	Intervals given are in hours of normal operation
Crankcase	5 qts (Note 1)				
Air Cleaner	1 qt				
OES-OIL, Engine, Sub-zero					

NOTES:

1. CRANKCASE CAPACITY. Use 4 qts if oil filter is not replaced. Use 5 qts if new oil filter is installed.

2. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW 10°F. Remove lubricants prescribed in the key for temperatures above -10°F. Clean parts with SOLVENT, dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10°F.

3. ENGINE OIL FILTER. Every 50 hours remove filter element, clean housing, install new element, fill crankcase, operate engine for 5 minutes, check for leaks, check crankcase oil level and bring to FULL mark.

MEC 6115-413-15/3-1②

Figure 3-1 ②—Continued

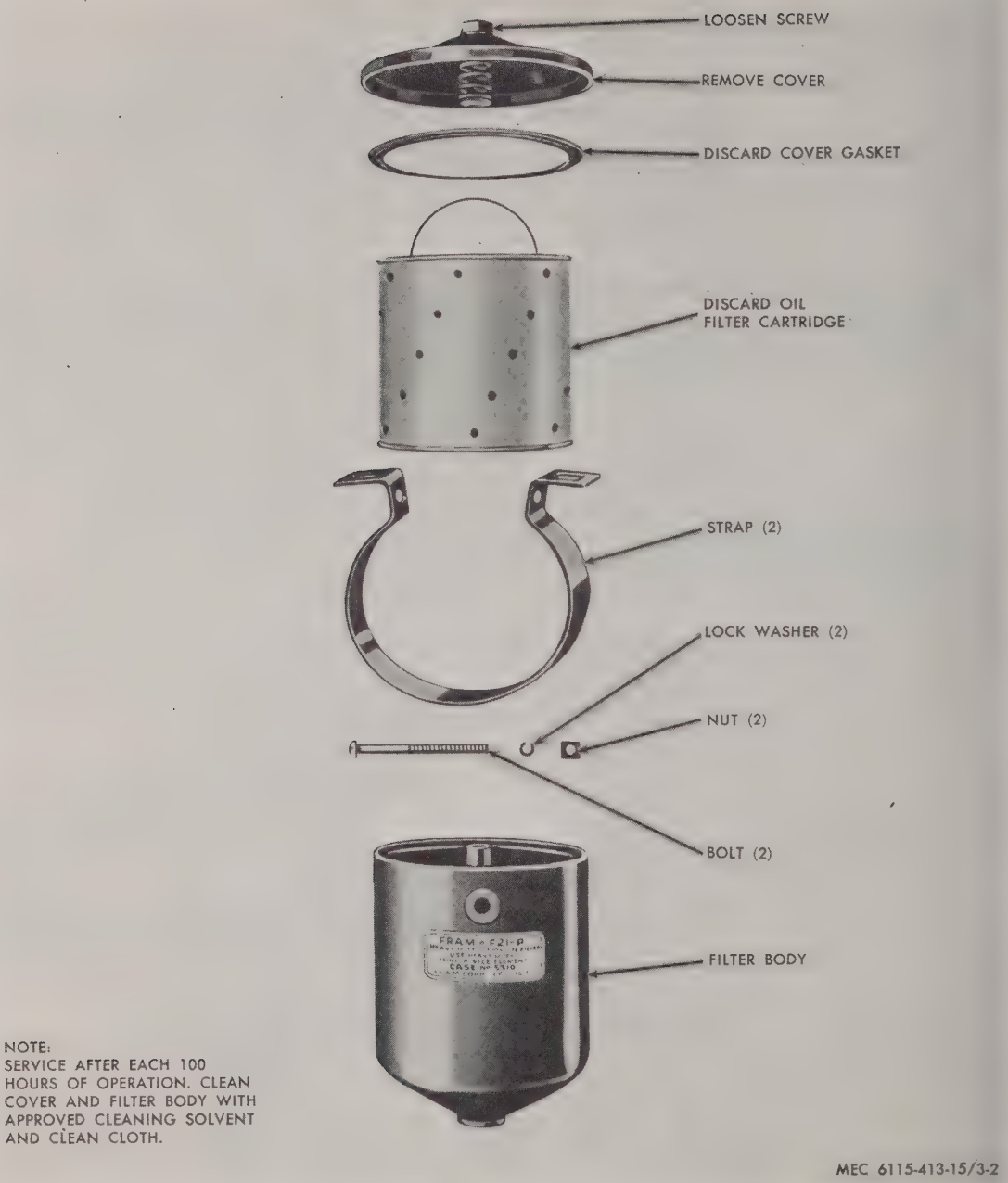
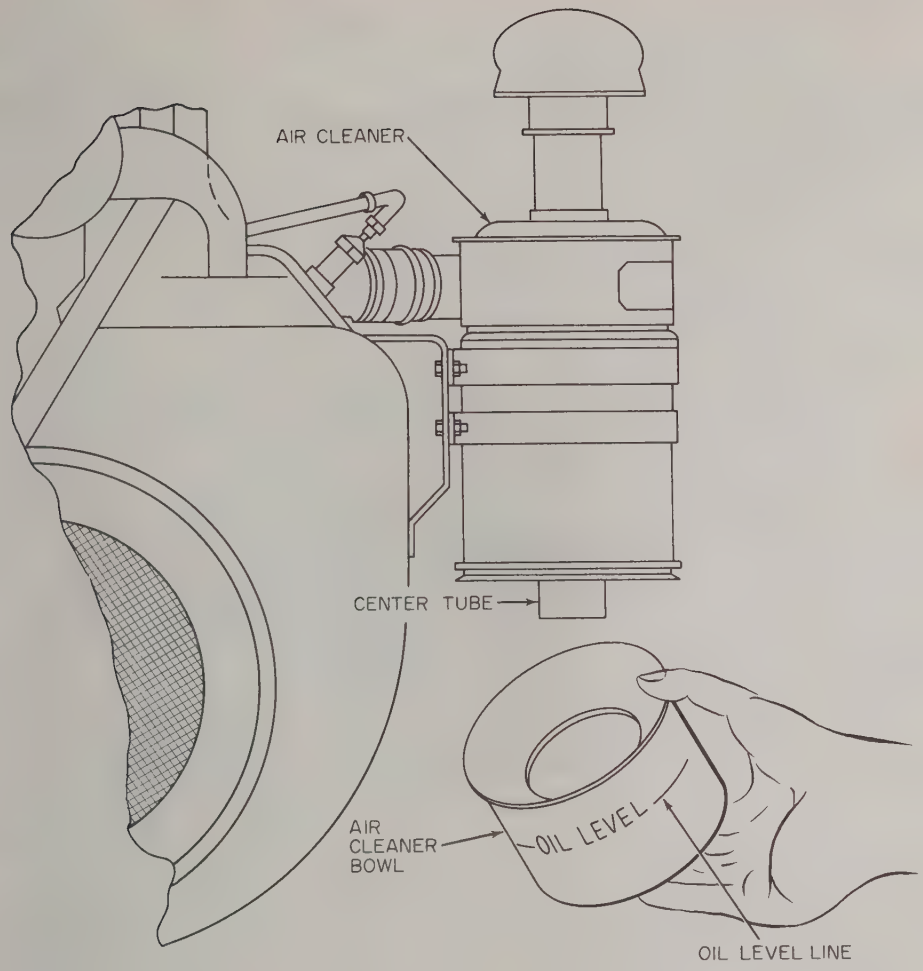


Figure 3–2. Oil filter service

discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed which would damage the equipment if operation were continued. All deficiencies and shortcomings will



NOTE:
SERVICE DAILY. CLEAN AIR CLEANER BOWL AND REFILL TO OIL LEVEL LINE WITH CRANKCASE OIL. USE SAE GRADE 10 FOR FREEZING WEATHER; SAE GRADE 30 FOR NORMAL (WARM) WEATHER; OR SAE GRADE 40 FOR EXTREMELY WARM WEATHER. INSPECT AND CLEAN LOWER SCREEN AND CENTER TUBE WHEN AIR CLEANER BOWL IS REMOVED. AT LEAST ONCE A YEAR REMOVE ENTIRE AIR CLEANER FROM ENGINE AND WASH NON-REMOVABLE ELEMENT IN APPROVED SOLVENT TO REMOVE DUST AND DIRT.

MEC 6115-413-15/3-3

Figure 3–3. Air cleaner service

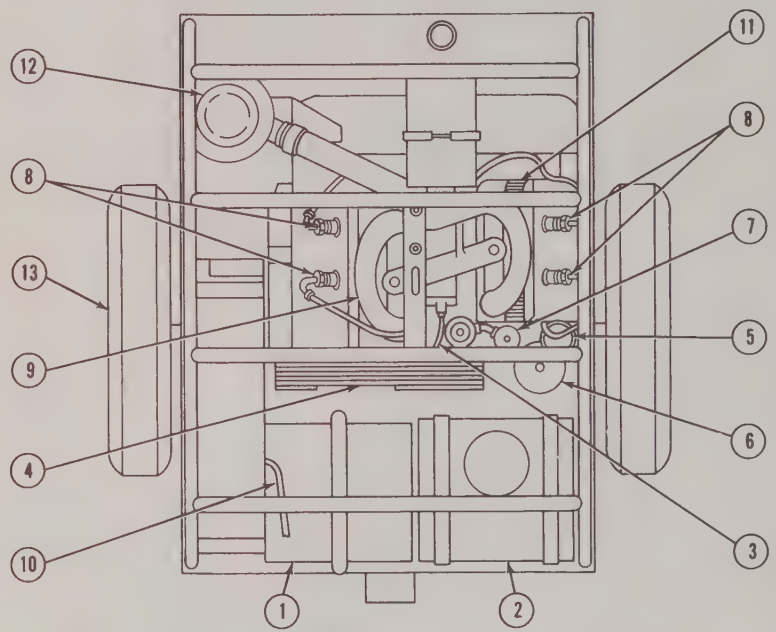
be recorded together with the corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance worksheet) at the earliest possible opportunity.

3–6. Daily Preventive Maintenance Services

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator or organizational maintenance personnel. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3–4 for the daily preventive maintenance services.

PREVENTIVE MAINTENANCE SERVICES
DAILY

TM 5-6115-413-15 BENDIX MODELS 59B2-1-A AND 59B2-1-B GENERATOR SET



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	BATTERY. TIGHTEN LOOSE CABLES AND MOUNTINGS. REMOVE CORROSION. FILL TO 3/8 IN. ABOVE PLATES. IN FREEZING WEATHER, RUN ENGINE A MINIMUM OF ONE HOUR AFTER ADDING WATER. CLEAN OUT VENT HOLE IN FILLER CAPS. (WEEKLY)	
2	FUEL TANK. ADD FUEL AS REQUIRED.	2-5e
3	FUEL LINES. INSPECT FOR LEAKS AND LOOSE CONNECTIONS.	
4	DRIVE BELTS. CHECK FOR WORN AND FRAYED BELTS. CHECK THAT BELTS DEFLECT APPROXIMATELY 1/2 IN. MIDWAY BETWEEN PULLEYS. (WEEKLY)	3-29
5	CRANKCASE OIL. CHECK OIL LEVEL. DRAIN AND REFILL. (50 HOURS)	2-5c
6	OIL FILTER. REPLACE OIL FILTER CARTRIDGE. (100 HOURS)	3-9
7	FUEL STRAINER. CLEAN SCREEN AND BOWL (50 HOURS)	3-40
8	SPARK PLUGS. CLEAN AND REGAP. (50 HOURS) REPLACE. (100 HOURS)	3-11
9	EXHAUST MANIFOLD. CLEAN EXHAUST MANIFOLD. (50 HOURS)	
10	ELECTRICAL CONNECTIONS. CHECK ALL ELECTRICAL CONNECTIONS FOR LOOSE CONNECTIONS, WORN AND FRAYED INSULATION, DAMAGED TERMINALS, OR POOR CONTACT.	
11	CYLINDER FINS. CLEAN CYLINDER FINS. (WEEKLY)	
12	AIR CLEANER. SERVICE AIR CLEANER.	3-10
13	TIRES. CHECK FOR PROPER AIR PRESSURE (65 POUNDS) IN TIRES. (WEEKLY)	

MEC 6115-413-15/3-4

Figure 3-4. Daily preventive maintenance services

3–7. Quarterly Preventive Maintenance Services

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3–5 for the quarterly preventive maintenance services.

Section IV. OPERATOR'S MAINTENANCE

3–8. General

Instructions in this section are published for the information and guidance of the operator to maintain the generator set.

3–9. Oil Filter Service

Refer to figure 3–2 and service the oil filter.

3–10. Air Cleaner Service

Refer to figure 3–3 and service the air cleaner.

3–11. Spark Plug Service

a. To remove spark plugs, use an open end wrench to loosen the shielded ignition cable connecting nuts. Unscrew the nuts and separate each cable from the spark plug.

b. Using a deep socket wrench, remove the spark plugs.

c. Inspect the spark plugs and clean or replace as necessary.

d. Clean the spark plugs by wire-brushing and by digging out carbon around the insulator with a sharp instrument.

e. Using a 0.030-inch spark plug gage, set the spark plug gap.

f. Install the spark plugs and tighten to a torque of 25 to 30 foot-pounds.

g. Insert the shielded ignition cable ends into the spark plugs and tighten the connector nuts.

3–12. Magneto Spark Check

If the magneto is suspected of providing weak or no ignition sparks (engine misfiring or hard starting), perform the following check before attempting any magneto adjustment or repair.

a. Unscrew shielded ignition cable from the cylinder No. 1 spark plug.

b. Insert the starting hand crank over the crankshaft (fig. 3–6).

c. Holding the terminal end of the shielded ignition cable ⅛ inch from the air shroud (or other electrical ground), turn the engine over slowly for at least two revolutions with the starting hand crank.

d. Observe the terminal end of the shielded ignition cable for spark discharges which should occur during each cycle.

e. Reconnect the shielded ignition cable to the spark plug and repeat the check with shielded ignition cables from cylinders No. 2, 3, and 4, in turn.

Note. Reconnect each ignition cable to the proper spark plug before removing the next ignition cable.

f. If weak sparks, or no sparks are observed, check breaker point gap adjustment (para 3–44) or remove magneto and repair as necessary. Refer this condition to direct support maintenance.

g. If strong sparks are observed from all shielded ignition cables, the magneto and cables can be eliminated as sources of trouble. Inspect spark plugs, electrical connections, and other leads for damage.

3–13. Voltage Regulator Adjustment

If output voltage is not correct, readjust voltage regulator output as described below.

a. Remove 10 screws securing louvered cover of control box assembly (fig. 1–1).

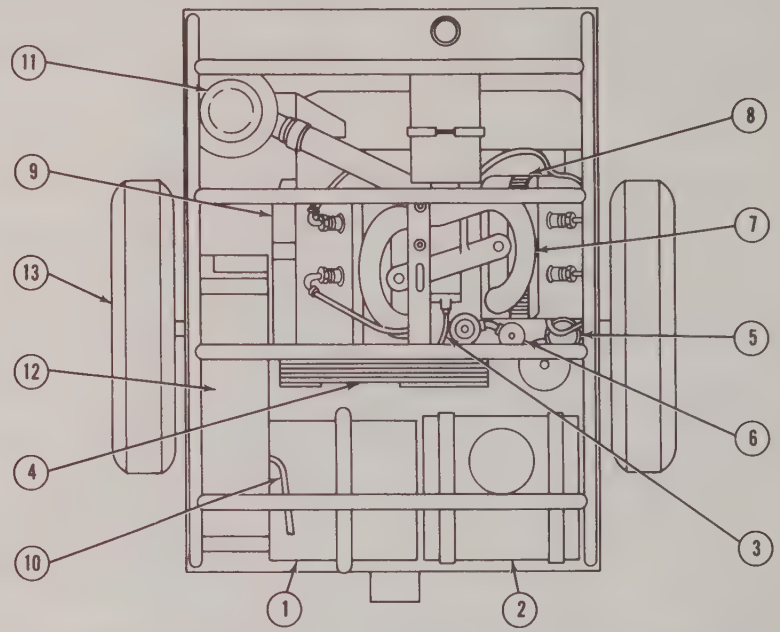
b. Loosen the locking nut of the voltage regulator potentiometer and turn the potentiometer shaft with a screwdriver until the output voltage is correct.

c. Tighten locking nut making sure not to disturb the potentiometer setting.

d. Reinstall cover of control box assembly.

PREVENTIVE MAINTENANCE SERVICES
QUARTERLY

TM 5-6115-413-15 BENDIX MODELS 59B2-1-A AND 59B2-1-B GENERATOR SET



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	BATTERY. TIGHTEN LOOSE CABLES AND MOUNTINGS. REMOVE CORROSION. FILL TO 3/8 IN. ABOVE PLATES. IN FREEZING WEATHER, RUN ENGINE A MINIMUM OF ONE HOUR AFTER ADDING WATER. CLEAN OUT VENT HOLE IN FILLER CAPS BEFORE INSTALLING. REPLACE IF BATTERY IS CRACKED OR LEAKING.	
2	FUEL TANK. ADD FUEL AS REQUIRED	2-5e
3	FUEL LINES. INSPECT FOR LEAKS AND LOOSE CONNECTIONS. REPLACE DAMAGED FUEL LINES.	
4	DRIVE BELTS. CHECK FOR 1/2 IN. DEFLECTION MIDWAY BETWEEN PULLEYS. REPLACE BELTS IF WORN, FRAYED, OR CRACKED.	3-29
5	CRANKCASE OIL. CHECK OIL LEVEL AND REFILL AS REQUIRED.	2-5c
6	FUEL STRAINER. CLEAN SCREEN AND BOWL.	3-40
7	EXHAUST MANIFOLD. CLEAN EXHAUST MANIFOLD.	
8	CYLINDER FINS. CLEAN CYLINDER FINS.	
9	STARTER GENERATOR BRUSHES. INSPECT STARTER GENERATOR BRUSHES. REPLACE IF BRUSH WEAR LINE IS NOT VISIBLE (TOTAL LENGTH LESS THAN 9/16 IN.)	
10	ELECTRICAL CONNECTIONS. CHECK ALL ELECTRICAL CONNECTIONS FOR LOOSE CONNECTIONS, WORN AND FRAYED INSULATION, DAMAGED TERMINALS, OR POOR CONTACT. BRUSH CORROSION FROM TERMINALS WITH A STIFF NON-WIRE BRUSH.	
11	AIR CLEANER. SERVICE AIR CLEANER	3-10
12	CONTROL BOX ASSEMBLY. INSPECT FOR WORN OR FRAYED WIRING AND INSECURE MOUNTING. INSPECT INTERIOR OF PANEL FOR LOOSE OR DAMAGED COMPONENTS AND FAULTY ELECTRICAL CONNECTIONS.	3-48
13	TIRES. CHECK FOR PROPER AIR PRESSURE (65 POUNDS) IN TIRES.	

MEC 6115-413-15/3-5

Figure 3-5. Quarterly preventive maintenance services

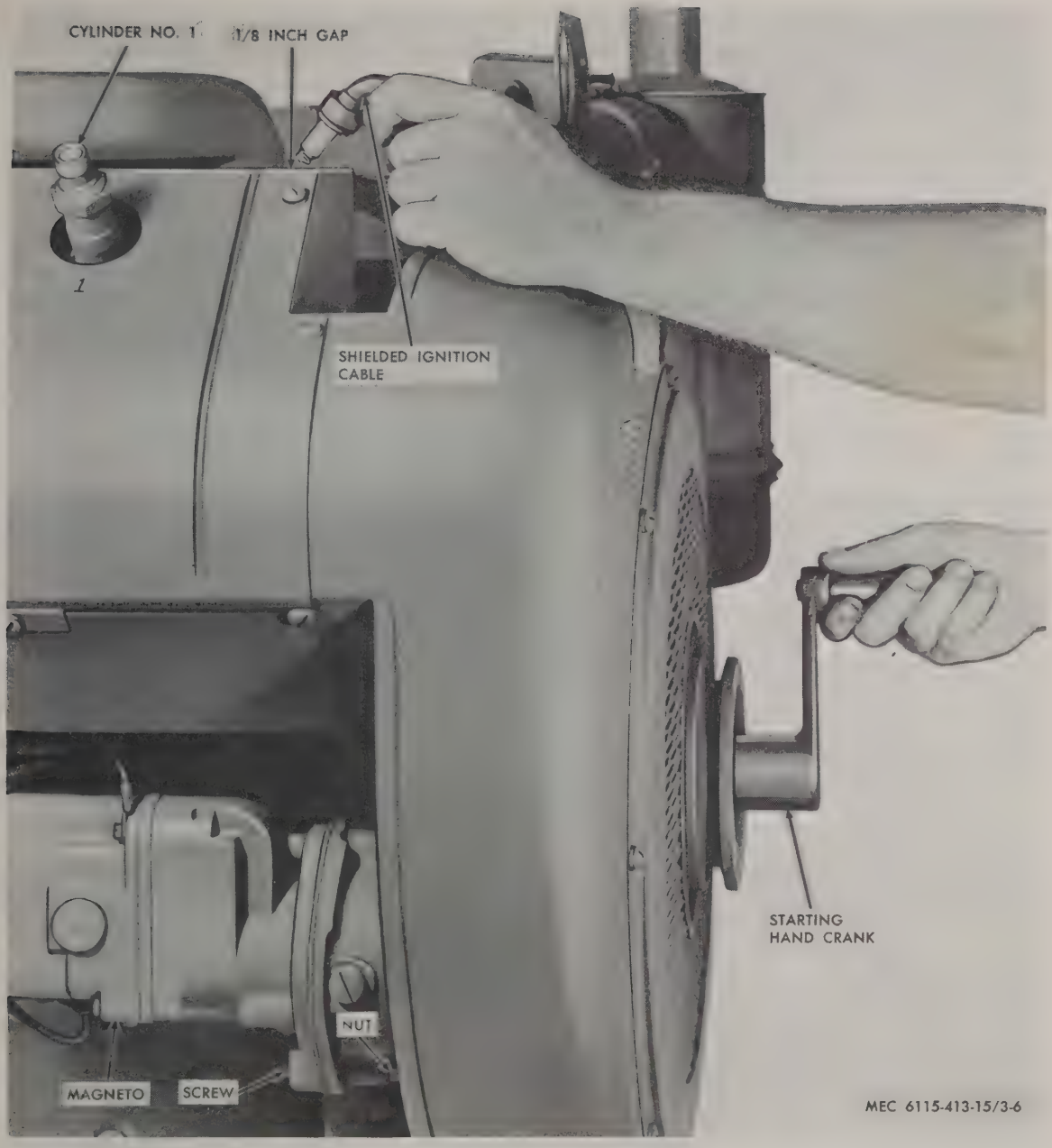


Figure 3–6. Magneto spark check

Section V. TROUBLESHOOTING

3–14. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the generator set and its components. Each trouble symptom stated is followed by a list of probable causes. The pos-

sible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to direct support maintenance.

3–15. Engine Fails to Start or Starts With Difficulty

Probable cause	*Possible remedy*
MAGNETO switch not set correctly	Set MAGNETO switch to RUN.
No fuel in tank	Fill fuel tank (para 2–5*e*).
Fuel tank selector valve handle set to incorrect position.	Set valve as required (paras 2–5*d* and 5*e*).
Excessive carbon, dirt, or moisture on spark plugs	Clean or replace spark plugs (para 3–11).
Spark plug gaps incorrect	Regap spark plugs (para 3–11).
Shielded ignition cables not connected properly	Check that cables connect between magneto end caps and corresponding numbered engine cylinders.
Air cleaner clogged	Service or replace air cleaner (para 3–10).
Water or dirt in fuel tank	Drain, clean, and refill fuel tank with correct fuel (para 2–5*e*).
Engine needs choking	Pull choke handle out and restart.
Magneto defective	Perform magneto spark check (para 3–12) and replace if necessary (para 3–23*c*).
Starter generator defective	Disassemble and correct trouble (report this condition to direct support maintenance).
Fuel pump defective	Replace fuel pump (para 3–41).
Breaker points defective or improperly gapped	Regap breaker points (para 3–44) or replace magneto (para 3–23*c*).
Capacitor defective	Replace magneto (para 3–23*c*).
Carburetor dirty or improperly adjusted	Adjust or replace carburetor (para 3–36).
Fuel lines clogged	Loosen fuel line nut at carburetor. If fuel line is not clogged, fuel will drip out. Clean out fuel lines if necessary.

3–16. Engine Overheats and Lacks Power

Probable cause	*Possible remedy*
Crankcase oil supply low	Check and fill crankcase if necessary (para 2–5*c*).
Choke closed	Push in choke handle fully to open choke.
Carburetor improperly adjusted	Adjust carburetor (para 3–36).
Exhaust manifold, muffler, or cylinder fins clogged	Replace exhaust manifold or muffler (para 3–33), or clean cylinder fins.
Inadequate air circulation	Position generator set for adequate cooling air flow.
Engine speed incorrect	Adjust governor (report this condition to direct support maintenance).
Engine or starter generator parts binding	Perform overhaul (report this condition to direct support maintenance).
Generator set overloaded	Check load and reduce if necessary.
Compression faulty	Check compression and correct as necessary (para 3–53).
Spark plugs fouled	Clean and regap or replace spark plugs (para 3–11).

3–17. Engine Misfires

Probable cause	*Possible remedy*
Choke closed	Push in choke handle fully to open choke.
Carburetor improperly adjusted	Adjust carburetor (para 3–36).
Spark plugs fouled or incorrectly gapped	Clean and regap or replace spark plugs (para 3–11).
Magneto defective	Perform magneto spark check (para 3–12) and replace if necessary (para 3–23*c*).

3–18. Excessive Smoke from Muffler

Probable cause	*Possible remedy*
Oil or water in fuel tank	Drain fuel tank and fill with correct fuel (para 2–5*e*).
Carburetor set too rich	Adjust carburetor (para 3–36).

3–19. Starter Generator Voltage too Low

Probable cause	*Possible remedy*
Starter generator has insufficient residual magnetism in field circuit.	Flash starter generator field circuit (para 3–51).
Voltage regulator improperly adjusted	Adjust voltage regulator (para 3–13).
Voltage regulator defective	Remove voltage regulator (para 3–48*a*) and replace defective parts (report this condition to direct support maintenance).
Starter generator defective	Disassemble and correct trouble (report this condition to direct support maintenance).
Generator drive belt improperly adjusted or defective	Adjust drive belt (para 3–29).

Section VI. RADIO INTERFERENCE SUPPRESSION

3–20. Definitions

a. Interference. The term "interference" as used herein applies to electrical disturbances in the radio frequency range which are generated by the generator set and which may interfere with the proper operation of radio receivers or other electronic equipment, or enable the enemy to locate the equipment.

b. Interference Suppression. The term "interference suppression" as used herein applies to the methods used to eliminate or effectively reduce radio interference generated by the generator set.

3–21. General Methods Used to Attain Proper Suppression

Essentially, suppression is attained by providing a low resistance path to ground stray currents. Methods used include shielding the ignition and high-frequency wires, grounding the frame with bonding straps, and using capacitors and resistors.

3–22. Interference Suppression Components

The suppression components used on the generator set consist of the shielded ignition cables, suppressor-type spark plugs, and radio shielded magneto.

3–23. Replacement of Suppression Components

a. Spark Plugs.

(1) Using an open end wrench, loosen shielded ignition cable connecting nuts and disconnect the cables from the spark plugs (fig. 3–7).

(2) Using a deep socket wrench, remove the spark plugs.

b. Shielded Ignition Cables.

Note. Do not pull on cable or twist braided shielding. Gently work cable from side to side and free the rubber seal. Do not use sharp metal tools to install rubber seals.

(1) Disconnect shielded ignition cables from spark plugs (para *a*).

(2) Unscrew cable connecting nuts from end caps of magneto (fig. 3–7).

(3) Remove four screws and external tooth lock washers securing clips to engine (fig. 3–7).

(4) Tag each shielded ignition cable with the proper cylinder number to facilitate assembly. The cable lengths differ.

Note. When connecting shielded ignition cables, make sure the cylinder numbers and the end cap numbers correspond.

c. Magneto.

(1) Disconnect shielded ignition cables (para *b*).

(2) Disconnect ground strap and magneto lead (fig. 3–7).

(3) Remove six screws and lift off flywheel shroud to gain access to gear cover assembly on engine.

(4) Remove nut and external tooth lock washer from upper stud, and remove

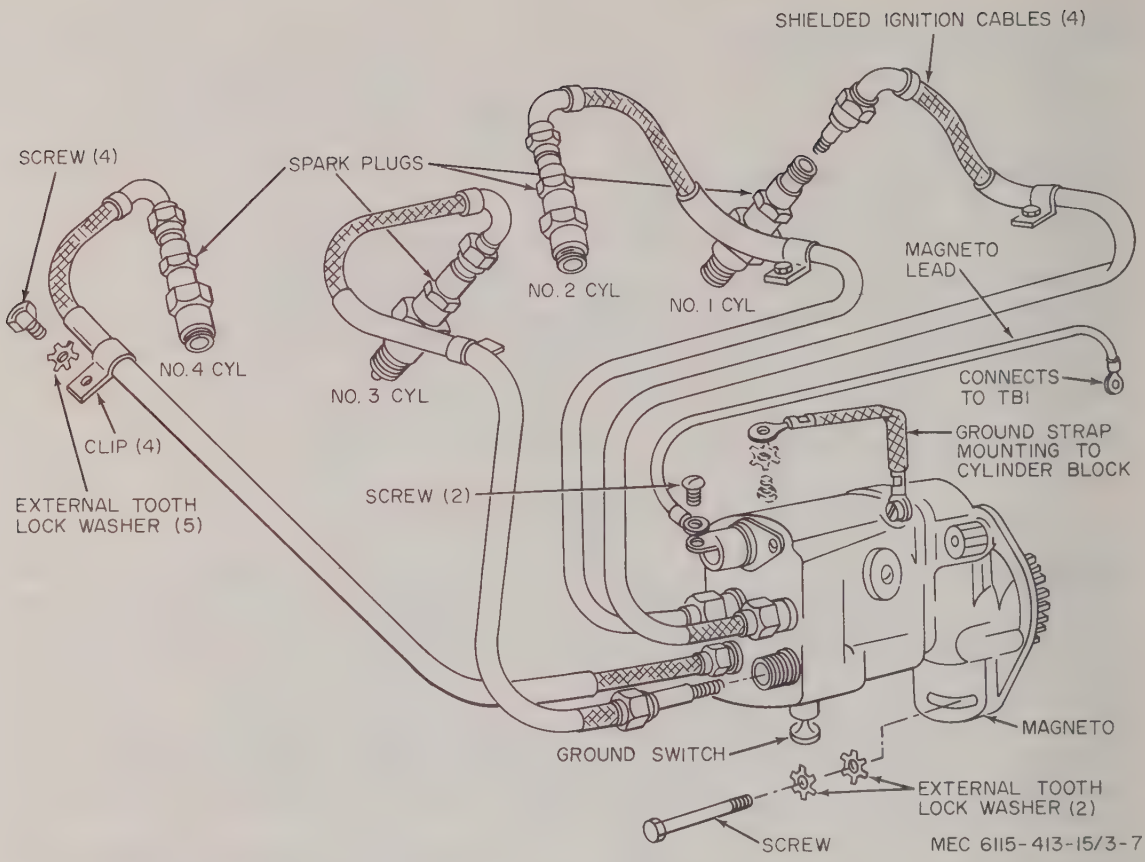


Figure 3–7. Replacement of suppression components

nut, two external tooth lock washers, and screw from lower mounting hole. Remove magneto from engine (figs. 3–6 and 3–8).

3–24. Testing of Radio Interference Suppression Components

Test the capacitors for leaks and shorts on a capacitor tester; replace defective capacitors. If test equipment is not available and interference is indicated, isolate cause by the trail-and-error method of replacing each capacitor in turn until the cause of interference is located and eliminated.

Section VII. AIR CLEANER

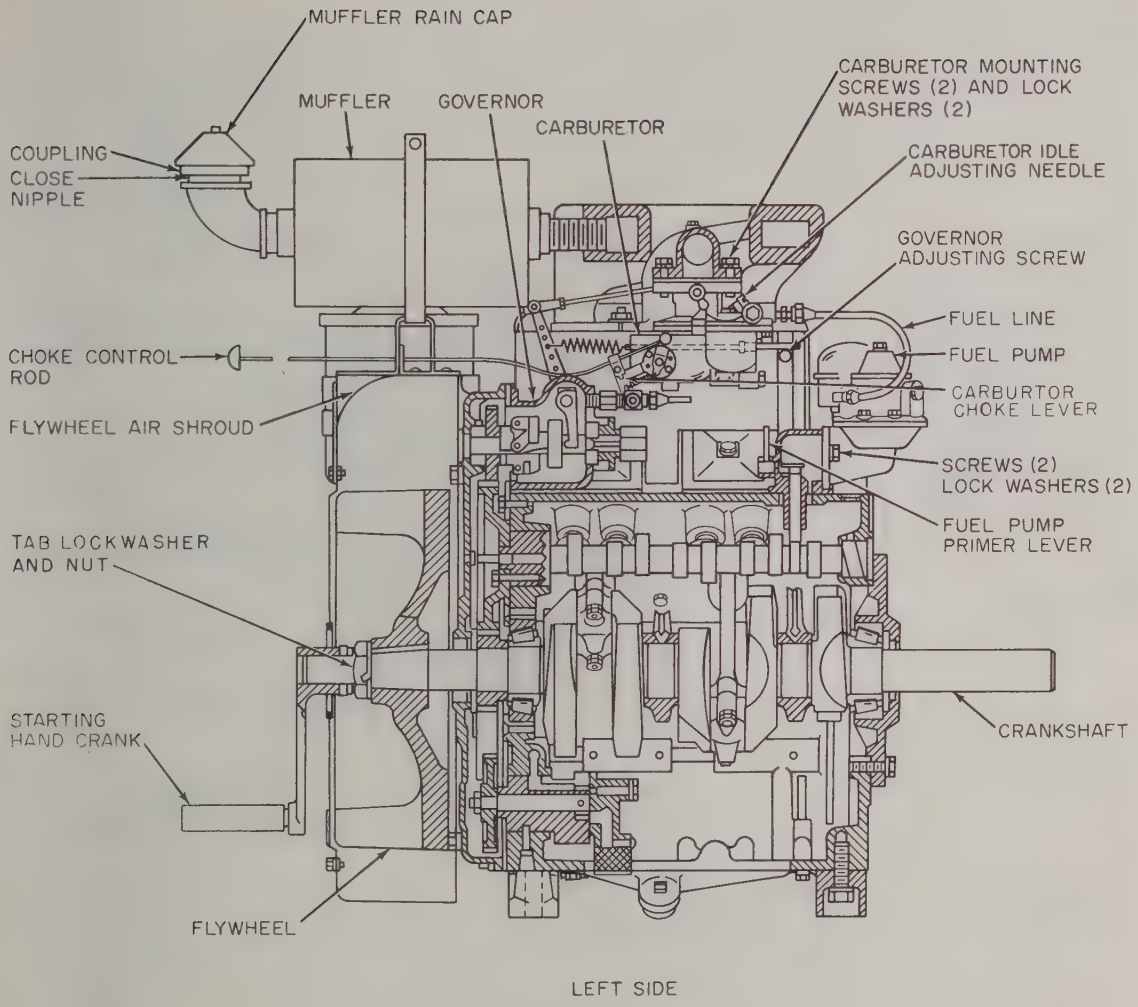
3–25. General

The air cleaner (fig. 1–4) is secured to a mounting plate on the front left end of the engine flywheel shroud.

3–26. Removal

a. Loosen hose clamp or clamps (2¼ in. ID) depending on whether the rubber hose, air cleaner tube, or rubber elbow require replacement (fig. 3–8).

b. Remove four hex head screws, lock washers, and nuts securing the air cleaner to the mounting plate (fig. 3–3).



MEC 6115-413-15/3-8①

Figure 3–8 ①. Engine cutaway view showing component locations

3–27. Installation

a. Position the air cleaner on the mounting plate and install four hex head screws and lock washers.

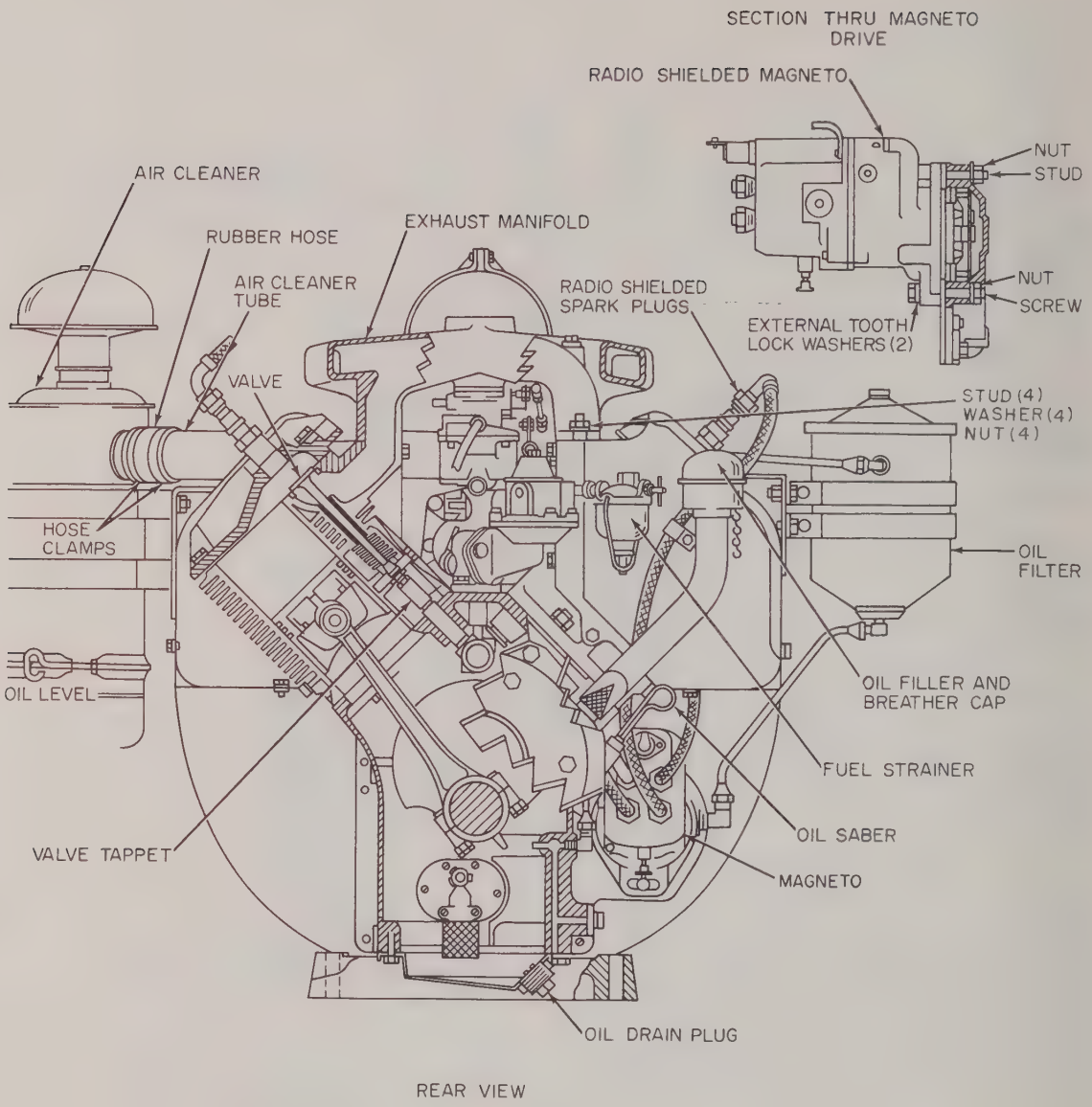


Figure 3–8 ②—Continued

b. Secure screws with nuts.

c. Slide rubber hose over air cleaner extension tube.

d. Position the 2¼ inch ID hose clamp over the rubber hose making sure it is also over the air cleaner and tighten the hose clamp screw securely.

3–28. General

The four drive belts used to turn the starter generator during operation, and to turn the engine over during starting, ride on four-groove sheaves mounted on the engine crankshaft and the starter generator drive shaft.

3–29. Drive Belt Tension Check and Adjustment

a. To check the drive belts for proper tension, press the thumb down on each belt midway between the two sheaves. If the tension is correct, each belt will deflect approximately ½ inch (fig. 3–9).

Note. If the tension on one or two of the belts is incorrect, the adjustment procedure (para b) will not correct the trouble and one or more of the belts will require replacement.

b. To adjust drive belt tension, loosen four screws in the slotted generator mounting base (fig. 3–9). Using a steel bar as a prying device, shift the starter generator position until drive belt tension is correct. Holding the steel bar in position to prevent movement, tighten the four screws.

c. Recheck drive belt tension after adjustment.

3–30. Removal

If one or more of the drive belts are worn, frayed, or cracked, replace the drive belt. Loosen the starter generator mounting screws (para 3–29*b*) and slide the starter generator toward the engine until the belts are loose enough for removal. If necessary, pull the generator drive sheave or engine drive sheave off the shafts and remove all drive belts.

Note. Be sure to keep the square keys with the proper sheave for each shaft.

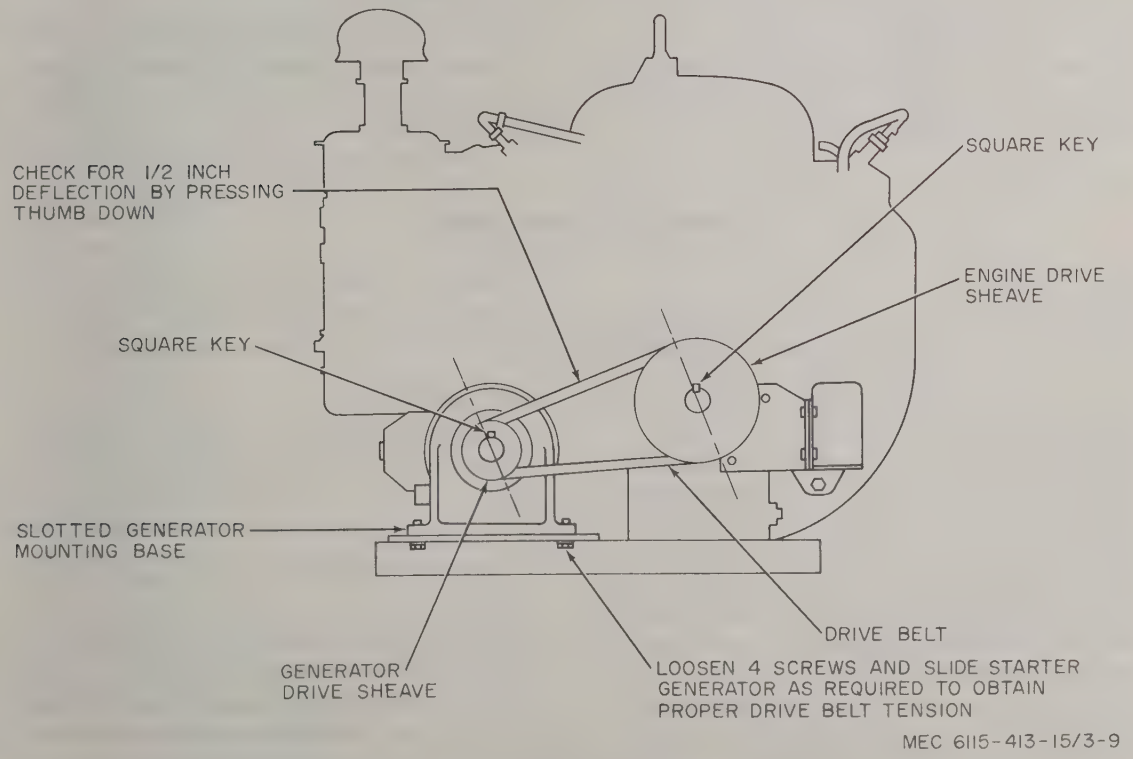

CHECK FOR 1/2 INCH DEFLECTION BY PRESSING THUMB DOWN
SQUARE KEY
ENGINE DRIVE SHEAVE
SQUARE KEY
SLOTTED GENERATOR MOUNTING BASE
DRIVE BELT
GENERATOR DRIVE SHEAVE
LOOSEN 4 SCREWS AND SLIDE STARTER GENERATOR AS REQUIRED TO OBTAIN PROPER DRIVE BELT TENSION
MEC 6115-413-15/3-9

Figure 3–9. Drive belt adjustment

3–31. Installation

a. If either generator drive sheave or engine drive sheave was removed, install the new drive belts in the grooves of the mounted sheave (smaller edges inward) and the removed sheave.

b. With the four screws (fig. 3–9) loose and the starter generator moved as close to the engine as possible, bring the loose ends of each drive belt over the loose sheave and insert into the proper grooves.

c. Install the sheave on the shaft and insert the square key (fig. 3–9).

d. Check and adjust the drive belt tension (para 3–29).

Section IX. EXHAUST COMPONENTS

3–32. General

The exhaust components of the generator set consist of the exhaust manifold and muffler. The muffler is provided with a rain cap to keep moisture out of the system (fig. 1–4).

3–33. Removal

a. Remove muffler rain cap, coupling, and close nipple from the muffler (fig. 3–8).

b. Unscrew muffler from exhaust manifold.

c. Remove two carburetor mounting screws and lock washers to free the carburetor from the exhaust manifold.

d. Remove four nuts and lock washers (fig. 3–8) and lift the exhaust manifold straight off the studs and carburetor.

3–34. Installation

a. Position the exhaust manifold over the carburetor so that the studs protrude through the manifold (fig. 3–8).

Note. Make sure carburetor gasket is in place.

b. Secure the exhaust manifold with four washers and nuts (fig. 3–8). Tighten nuts to a torque of 23 foot-pounds. Do not exceed this torque.

c. Install two carburetor mounting screws and lock washers (fig. 3–8).

d. Secure muffler to exhaust manifold.

e. Install close nipple in muffler elbow. Thread coupling over nipple, and install muffler rain cap (fig. 3–8).

Section X. CARBURETOR

3–35. General

The carburetor is located directly under the exhaust manifold. The carburetor is of the updraft single Venturi design.

3–36. Adjustment

If engine idles roughly, set the idle adjusting needle for best low speed smooth operation. Turning the idle adjusting needle (fig. 3–8) inward (clockwise) increases the fuel suction and results in a richer mixture. Turning the idle adjusting needle outward (counterclockwise) increases the quantity of air and results in a leaner mixture.

3–37. Removal

a. Remove exhaust manifold (para 3–33).

b. Remove and discard carburetor gasket.

c. Disconnect fuel line from fuel pump and choke and governor linkage parts (fig. 3–8).

d. Remove the carburetor from the engine.

3–38. Installation

a. Connect the choke control rod to the carburetor choke lever (fig. 3–8).

b. Connect the governor control rod lever ball joint to the carburetor throttle lever.

c. Connect fuel line from fuel pump to the carburetor.

d. Install a new carburetor gasket over the carburetor flange.

e. Carefully position exhaust manifold over carburetor, and install two carburetor mounting screws and lock washers.

f. Secure exhaust manifold (para 3–34).

Section XI. FUEL PUMP AND FUEL STRAINER

3–39. General

The fuel pump (fig. 1–3) is connected to an adapter and primer which is used to help pump the fuel when an engine has been out of operation for a long time. The fuel is filtered by a fuel strainer before it enters the fuel pump.

3–40. Cleaning Fuel Strainer

Inspect fuel strainer frequently, and clean when required.

a. Shut off fuel valve (fig. 3–10).

b. Loosen knurled nut.

c. Swing the wire bail to one side and remove glass bowl, gasket, and filter screen.

d. Clean glass bowl and filter screen with an approved cleaning solvent.

e. Use a new gasket if the removed gasket is not in good condition.

f. When installing parts, do not tighten knurled nut excessively.

3–41. Fuel Pump Removal

a. Make sure fuel strainer fuel valve is shut off.

b. Remove fuel strainer elbow and fuel line elbow or disconnect fuel line at the elbow.

c. Remove two screws and lock washers (fig. 3–8) and remove fuel pump. Discard fuel pump gasket.

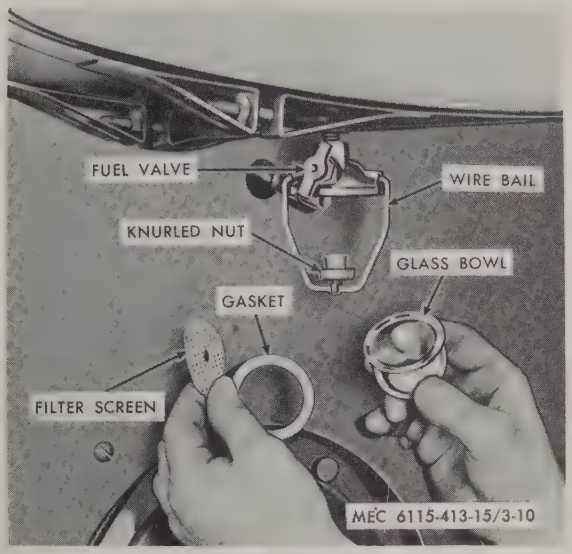


Figure 3–10. Removal of fuel strainer parts

3–42. Fuel Pump Installation

a. Position new fuel pump gasket in place and secure fuel pump with two screws and lock washers (fig. 3–8).

b. Connect fuel line from carburetor to fuel line elbow.

c. Connect fuel strainer elbow to inlet side of fuel pump.

d. Open fuel valve on fuel strainer.

Section XII. MAGNETO

3–43. General

The magneto is a radio shielded assembly that contains the breaker points, capacitor, and timing gearing for determining the spark advance.

3–44. Breaker Point Adjustment

If the ignition spark is weak when checked (para 3–12), breaker points may require adjustment. If adjustment does not correct the trouble, replace the magneto and report the condition to direct support maintenance.

a. Remove four end cover screws from the magneto and lift away the end cover with the shielded ignition cables attached.

b. Inspect the breaker points. If there is evidence of pitting, resurface the points with a small tungsten file.

c. If points are badly pitted or worn, replace them.

d. Check breaker point gap by inserting the starting hand crank and rotating the engine until the breaker point gap is fully open. Measure the gap with a feeler gage (fig. 3–11). The gap should be 0.015 inch.

e. If the breaker point gap is not correct, loosen two locking screws on the contact plate (fig. 3–11).

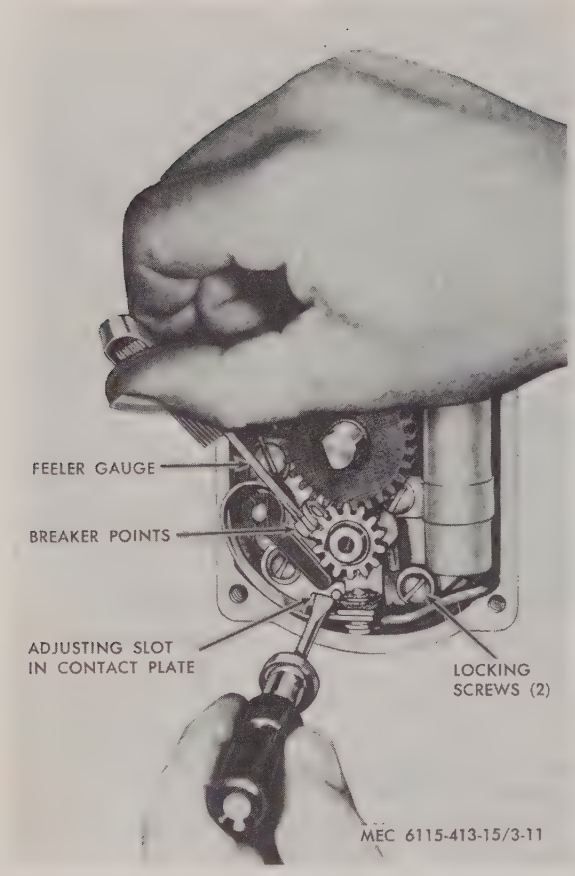


Figure 3–11. Magneto breaker point adjustment

f. Insert a small screwdriver into the contact plate adjusting slot and open or close the gap by moving the contact plate as required.

g. When the gap is correct, tighten the locking screws and recheck the gap.

h. Install magneto end cover and gasket carefully to assure proper seal, and secure with four screws and lock washers.

Note. The two longer screws are to be installed in the lower pair of mounting holes.

3–45. Removal

Remove magneto as described in paragraph 3–23*c*.

3–46. Installation

a. Secure magneto to frame with a screw, two external tooth lock washers, and a nut for the lower bracket mounting hole, and with a nut and stud on the upper mounting hole (fig. 3–8).

b. Connect the ground strap and magneto lead (fig. 3–7).

c. Connect the shielded ignition cables to the corresponding cylinder numbered end caps.

Section XIII. CONTROL BOX ASSEMBLY COMPONENTS

3–47. General

The control box assembly components that are replaceable at organizational maintenance consist of the voltage regulator, load switch, magneto switch, voltmeter, and time totalizing meter.

3–48. Removal

a. Voltage Regulator

(1) Remove 10 screws and lift out control box cover (fig. 3–12).

(2) Pull voltage regulator straight out of voltage regulator base assembly.

b. Meters.

(1) Remove four screws and open hinged indicator panel in order to gain access to electrical connections.

(2) Disconnect the leads from the terminal lugs of the meter to be replaced.

(3) Remove three screws, nuts, and lock washers from the meter to be replaced.

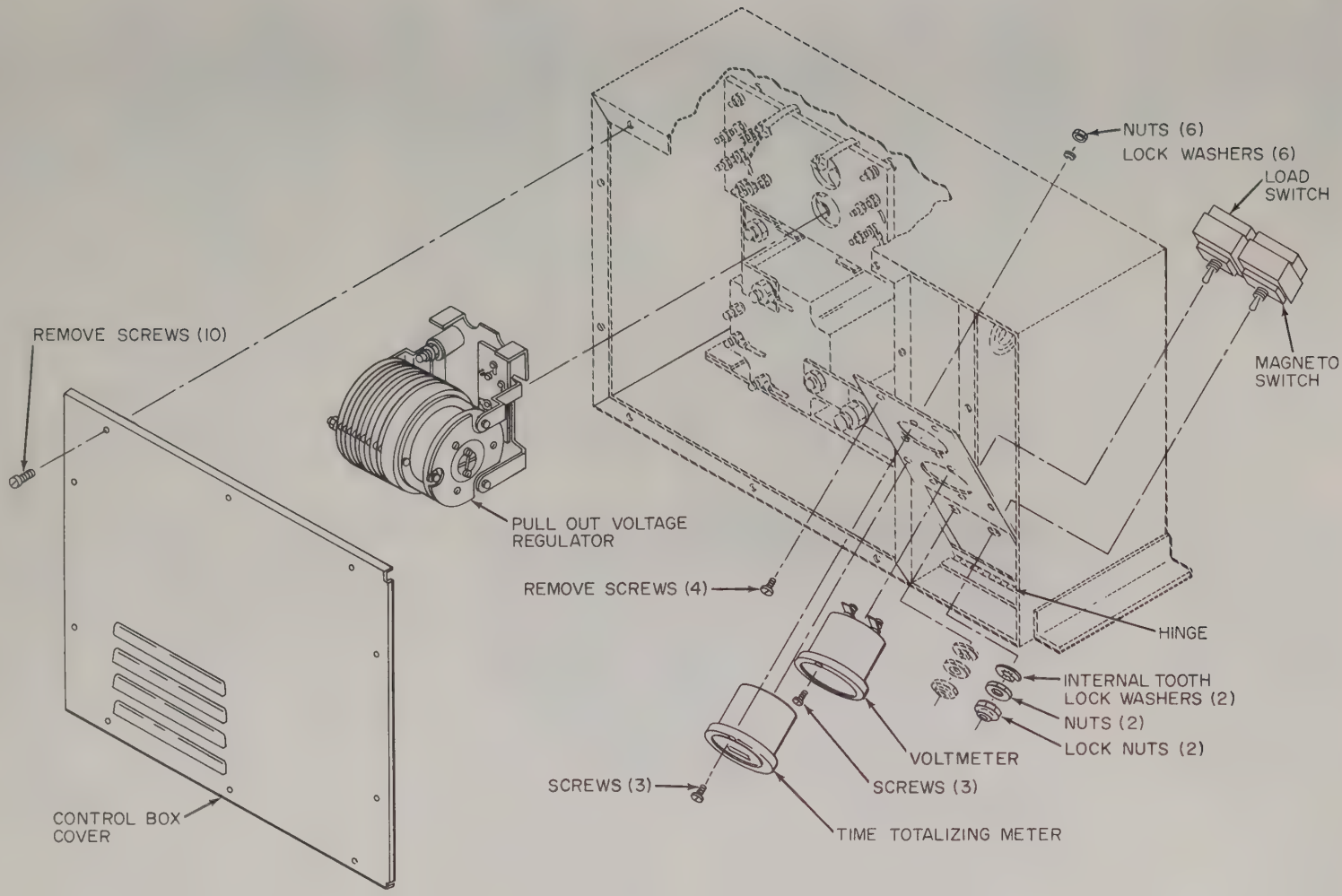
c. Switches.

(1) Remove four screws and open hinged indicator panel in order to gain access to electrical connections.

(2) Disconnect the leads from the terminal lugs of the switch to be replaced.

(3) Remove the lock nut, nut and internal tooth lock washer from the front of the panel.

(4) Remove the switch from the inside of the panel.



MEC 6115-413-15/3-12

Figure 3–12. Removal of control box assembly components

3–49. Installation

a. See figure 3–12 and install the removed component.

b. If the switches or meters were removed, see figure 1–5 for electrical connections.

Section XIV. STARTER GENERATOR

3–50. General

The starter generator serves the dual purpose of starting the engine and of providing the output voltage by being driven by the engine during normal operation. The starter generator is mounted alongside the engine (fig. 1–1) and is coupled to the engine by a sheave and belt arrangement (fig. 3–9).

3–51. Flashing the Starter Generator Field

If the starter generator voltage does not build up properly due to loss of residual magnetism in the shunt field circuit, flash the field as follows:

a. Connect the positive terminal of a 12-volt battery through an spst (single-pole, single-throw) knife switch to terminal A on the starter generator terminal board.

Caution: **Always use a knife switch when flashing the field. Opening the circuit at the starter generator or battery terminals can result in severe damage to the terminals or explosion of the battery.**

b. Connect the negative terminal of the battery to terminal E on the starter generator terminal board.

c. Apply battery current to the shunt field for 5 seconds by closing the knife switch.

d. Repeat the operation several times to be sure that the field is properly flashed.

Section XV. ENGINE COMPRESSION

3–52. General

This section provides methods of checking and restoring compression. Where remedies given cannot restore compression, major repair will be required. Report this condition to direct support maintenance.

3–53. Compression Check

Insert the starting hand crank into the crankshaft and turn the engine over. If considerable resistance is not encountered in the pull on the hand crank, compression is faulty. Check for possible remedies that can be performed by organizational level maintenance personnel (para 3–54).

3–54. Causes of Faulty Compression

a. If the engine has been out of operation for any length of time, the cylinders may be dry. Refer to paragraph 3–55 for corrective action.

b. Check for loose or broken spark plugs if a hissing noise is heard when cranking the engine. The noise is due to escaping fuel during the compression stroke. If the spark plugs are satisfactory, the trouble is likely to be a damaged cylinder head gasket or loose cylinder head.

c. If valves are stuck in the open position due to carbon or gum deposits on the valve stems, cleaning is required. Report this condition to direct support maintenance.

d. If valve tappets have insufficient clearance under valve stems, they require readjustment. Report this condition to direct support maintenance.

e. If piston rings are stuck in the pistons due to carbon accumulation, it will be necessary to remove the piston and connecting rod assemblies for cleaning. Report this condition to direct support maintenance.

f. If cylinders are scored, they may require reboring and fitting with new pistons and piston rings, or replacement of the entire cylinder block may be necessary. Report this condition to direct support maintenance.

3–55. Restoring Compression

If compression is faulty due to the engine

being out of service for a period of time, proceed as follows:

a. Remove spark plugs (para 3–11).

b. Pour approximately one fluid ounce of crankcase oil into each cylinder through the spark plug hole.

c. Using the starting hand crank, turn the engine over several times to distribute the oil over the cylinder walls.

d. Install spark plugs.

e. Recheck compression (para 3–53). If still not satisfactory, one of the other causes (para 3–54) is responsible. Report this condition to direct support maintenance.

Section XVI. FLYWHEEL

3–56. General

The flywheel serves a dual purpose of acting as a conventional flywheel and of a cooling fan. The flywheel shroud (fig. 1–4) directs the cooling air by ducts and baffle plates to assure uniform cooling of all parts.

3–57. Removal

a. Remove six screws and lock washers securing the flywheel screen to the flywheel shroud (fig. 1–4).

b. Drive out the starting crank pin from the crankshaft.

c. Remove the nut and tab lock washer from the crankshaft.

d. Take a firm hold on the flywheel fins and pull outward, at the same time striking the end of the crankshaft with a wooden mallet or aluminum hammer (fig. 3–13). The flywheel will slide off the tapered end of the crankshaft. Remove and retain the woodruff key for installation.

Caution: **Do not use a steel hammer as it may cause damage to the crankshaft and bearings.**

Figure 3–13. Removal of flywheel

3–58. Installation

a. Insert the woodruff key in the slot in the crankshaft.

b. Position the flywheel over the crankshaft so that the key-slot is aligned with the key.

c. Slide the flywheel onto the crankshaft as far as possible by hand, and install the tab lock washer and nut. Bend the tabs over the nut to retain the nut (fig. 3–8).

d. Insert starting crank pin through the crankshaft so that it protrudes equally on both sides.

e. Secure flywheel screen with six screws and lock washers.

f. Insert the starting hand crank and turn the engine over to make sure parts are not binding.

CHAPTER 4

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4–1. Scope

These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the Bendix models 59B2–1–A and 59B2–1–B generator set. They provide information on the maintenance of the equipment, which is beyond the scope of tools, equipment, personnel, or supplies normally available to using organizations.

4–2. Record and Report Forms

For record and report forms applicable to direct and general support and depot maintenance, refer to TM 38–750.

Note. Applicable forms, excluding Standard Form 46 which is carried by the operator, shall be kept in a canvas bag mounted on equipment.

Section II. DESCRIPTION AND TABULATED DATA

4–3. Description

For a complete description of the generator set see paragraph 1–3.

4–4. Tabulated Data

a. General. This paragraph contains the overhaul data pertinent to direct and general support and depot maintenance personnel.

b. Generator Classification and Rating.

Type	Long shunt, cumulative compound
Rated current	300 amp
Output voltage (dc)	30 v
Regulated field current	8 amp max
Lubrication	Sealed bearings
Drive	Belt
Cooling	Fan
Duty classification	Continuous

c. Generator Repair Standards.

Stator:	
Number of main field poles	4
Number of interpoles	4
Pole shoe type	Laminated
Wire size	No. 18 AWG
Type of wire	Heavy M.L.
Insulating materials	Vacuum impregnated epoxy resin
Lead connections	Silver brazed (MIL–B–7883)
Armature:	
Number of slots	37
Number of coils	37
Type of wire	Heavy M.L.
Wire size	0.100 x 0.190 in.
Insulating materials	Vacuum impregnated epoxy resin
Armature core	Laminated
Coil connections	Silver Brazed (MIL–B–7883) coil to commutator with brazing clips.

d. Torque Data.

Spark plug	25–30 ft lb
Cylinder head screws	22–24 ft lb
Gear cover cap screws	14–18 ft lb
Oil pan mounting screws	6–9 ft lb
Cylinder block mounting nuts	40–50 ft lb
Connecting rod nuts	22–24 ft lb
Main bearing plate cap screws	25–30 ft lb
Carburetor manifold mounting nuts	23 ft lb (max)
Starter generator terminal block mounting bolts	35–40 in. lb

e. Repair and Replacement Standards. Table 4–1 lists manufacturer's sizes, tolerances, desired clearances, and maximum allowable wear and clearances.

f. Wiring Diagram. See figure 1–5 for a wiring diagram of this generator set.

Table 4–1. Repair and Replacement Standards

Component	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Minimum	Maximum	Minimum	Maximum	
Starter Generator:					
Armature shaft bearing surfaces	0.9843	0.9846	0.0005T	0.0000L	0.0003
Ball bearing ID	0.9841	0.9843	0.0005T	0.0000L	0.0002
Ball bearing OD	2.0470	2.0472	0.0000T	0.0005L	0.0002
Housing bearing surface	2.0472	2.0475	0.0000T	0.0005L	0.0003
Endbell bearing surface	2.0472	2.0475	0.0000T	0.0005L	0.0003
Engine:					
Piston to cylinder clearance at piston skirt thrust faces			0.0032	0.0042	
Piston ring gap (compressed)			0.010	0.020	
Piston ring side clearance in grooves:					
Top ring			0.002	0.004	
Scraper ring			0.0015	0.0035	
Oil ring			0.001	0.003	
Connecting rod to crank pin side clearance			0.009	0.016	
Connecting rod shell bearing to crank pin clearance			0.0005	0.0020	
Piston pin to piston clearance			0.0000	0.0003	
Piston pin to connecting rod bushing clearance			0.0003	0.0006	

T denotes interference fit

L denotes clearance fit

CHAPTER 5

GENERAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

5–1. Special Tools and Equipment

No special tools or equipment is required for performing maintenance on the generator set.

5–2. Specially Designed Tools and Equipment

No specially designed tools or equipment is required for performing maintenance on the generator set.

Section II. TROUBLESHOOTING

5–3. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the generator set or any of its components. Each trouble symptom stated is followed by a list of probable causes. The possible remedy recommended is described opposite the probable cause.

5–4. Engine Fails to Start or Starts with Difficulty

Probable cause	*Possible remedy*
Breaker points defective or improperly gapped	Regap or replace breaker points (para 6–42).
Capacitor defective	Replace capacitor (para 6–42).
Carburetor dirty or defective	Clean or replace defective carburetor parts (para 6–28).
MAGNETO switch wiring defective	Check wiring (fig. 1–5) and correct as necessary.
Magneto defective	Disassemble and replace defective parts (para 6–42).
Starter generator defective	Disassemble and replace defective parts (para 6–13).
Fuel pump defective	Disassemble and replace defective parts (para 6–35).

5–5. Engine Lacks Power

Probable cause	*Possible remedy*
Piston rings worn	Replace piston rings (para 6–24*f*).
Cylinders worn or scored	If cylinders are worn more than 0.005 in. oversize, regrind and fit with oversize pistons and piston rings.
Damaged bearings	Replace bearings (para 6–24*f* and 6–24*g*).
Carburetor dirty	Clean or replace defective carburetor parts (para 6–28).
Parts binding	Check and replace damaged parts (para 6–21 thru 6–24).

5–6. Engine Overheats

Probable cause	*Possible remedy*
Ignition spark timing incorrect	Set magneto timing (para 6–46).
Excessive carbon deposits	Disassemble and clean engine components (para 6–22).
Temperature safety switch open	Allow engine to cool for 5 minutes. Correct trouble before restarting. Check for overload, dirt around cooling fins, dirty air intake screen, clogged air cleaner, faulty ignition timing, or lack of lubrication.

5–7. Engine Knocks

Probable cause	*Possible remedy*
Low octane rating of gasoline	Use correct fuel.
Carbon or lead deposits	Clean cylinder head (para 6–22).
Loose or defective connecting rod shell bearings	Disassemble and correct trouble (para 6–21).
Worn or loose piston pin	Disassemble and correct trouble (para 6–21).
Spark advanced too far	Set magneto timing (para 6–46).
Valve guides worn	Replace valve guides (para 6–23*c*).
Valve springs weak or broken	Replace valve springs (para 6–24*c*).

5–8. Engine Speed Erratic

Probable cause	*Possible remedy*
Carburetor defective	Clean or replace defective carburetor parts (para 6–29).
Governor set incorrectly	Set governor (para 6–25).

5–9. Generator Output Erratic

Probable cause	*Possible remedy*
Voltage regulator defective	Disassemble and replace defective parts (para 6–4).
Starter generator defective	Disassemble and replace defective parts (para 6–13).

Section III. RADIO INTERFERENCE SUPPRESSION

5–10. General

Refer to TM 11–483 for definitions, purposes, source and methods used to obtain proper radio suppression.

5–11. Interference Suppression Components

All suppression components used on the generator set are covered in paragraph 3–22 (fig. 3–7).

5–12. Replacement of Suppression Components

Replacement of suppression components is covered in paragraph 3–23.

Section IV. REMOVAL AND INSTALLATION OF MAJOR COMPONENTS

5–13. General

With the exception of the starter generator, all easily removable major components are covered in Chapter 3. The remainder of the assemblies are covered in the applicable sections of Chapter 6.

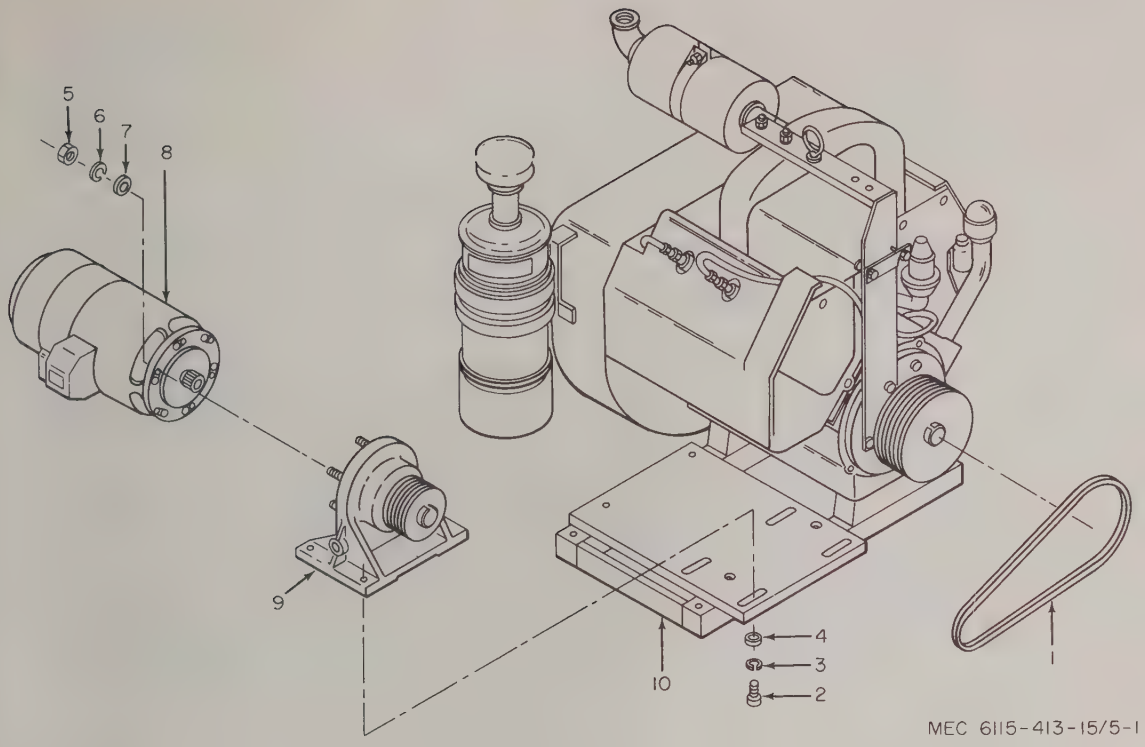
5–14. Starter Generator

a. Removal.

(1) Loosen screws (2, fig. 5–1) and slide assembled starter generator (8) and drive adapter assembly (9) toward the engine.
(2) Remove four drive belts (1).
(3) Remove four screws (2), lock washers (3), and flat washers (4), and remove assembled starter generator (8) and drive adapter assembly (9) from engine and base assembly (10).
(4) Remove five nuts (5), lock washers (6), and flat washers (7), and slide starter generator spline out of drive adapter assembly (9).

b. Installation.

(1) Insert spline of starter generator (8) into drive adapter (9) and make sure splines are engaged properly.
(2) Secure with five nuts (5), lock washers (6), and flat washers (7).
(3) Secure the assembled starter generator and drive adapter assembly to engine and base assembly (10), and adjust drive belt tension as described in paragraph 3–29.



1 Drive belt (4)
2 Screw, cap socket-hd, ⅜–16 x 1⅛ in. (4)
3 Washer, lock, ⅜ in. (4)
4 Washer, flat, ⅜ in.
5 Nut, hex, ⅜–24 (5)
6 Washer, lock, ⅜ in. (5)
7 Washer, flat, ⅜ in. (5)
8 Starter generator
9 Drive adapter assembly
10 Engine and base assembly

Figure 5–1. Starter generator, removal and installation

CHAPTER 6

ENGINE REPAIR INSTRUCTIONS

Section I. VOLTAGE REGULATOR

6–1. General

This section contains complete repair instructions for the voltage regulator. This carbon pile-type voltage regulator is used to regulate the output voltage of the generator assembly, and provides constant voltage with variations in generator speed and load conditions.

6–2. Removal

Remove the voltage regulator as described in paragraph 3–48*a*.

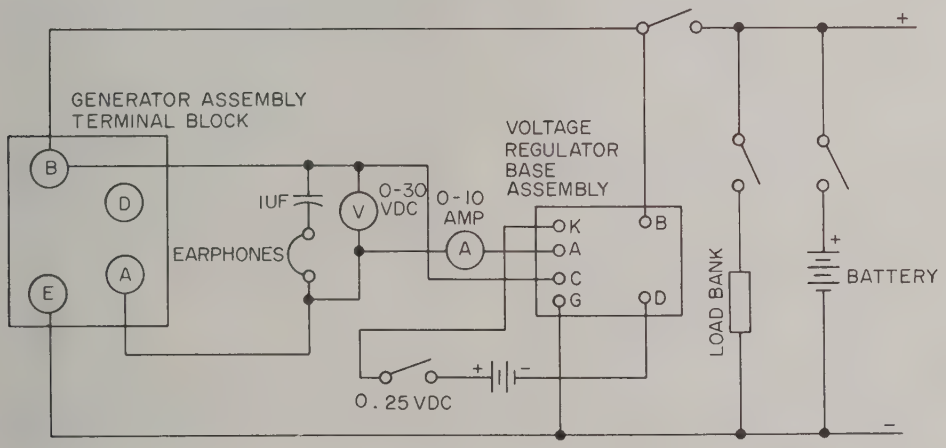
6–3. Bench Testing

a. Plug the voltage regulator into voltage regulator base assembly, and connect to the generator assembly as shown in figure 6–1.

b. Using Wheatstone bridge, measure resistance between terminals K and D. Reading must be between 0.36 and 0.44 ohm at 68° F.

c. Adjust regulator potentiometer to approximate mid-range position.

d. Make sure regulator core is set to flush position (painted line).



NOTES:
BATTERY:
2 AIRCRAFT STORAGE BATTERIES TYPE K-1, HIGH RATE DISCHARGE 12 VOLTS, 540 AMPERES FOR 3.75 MINUTES (SPECIFICATION 32587-A) STOCK NO. AERNO 42-465 OR EQUIVALENT.
LOAD BANK:
100 AMP AT 27.7 VDC.
200 AMP AT 27.7 VDC.

SYMBOL LEGEND
KNIFE SWITCH
CAPACITOR
BATTERY

MEC 6115-413-15/6-1

Figure 6–1. Voltage regulator, test connections

e. Force-cool generator assembly with approximately 92 cubic feet of air per minute (equivalent to 6 inches of water static plus velocity head).

f. Operate generator assembly at 6000 rpm with no load applied.

g. Turn in regulator adjusting screw until regulated voltage rises and peaks, and then dips to a minimum (fig. 6–2). If necessary, set dip to 3 volts as follows:

(1) Remove power.

(2) Remove regulator core and insert armature adjusting tool 1106029–1 to engage regulator armature.

(3) Use hexagon portion of tool to keep diaphragm from turning, and use spanner portion of tool to engage armature. Turn armature 0.001 inch for each adjustment, clockwise to raise dip, and counterclockwise to lower dip.

(4) Remove tool and insert core in flush position.

(5) Apply power and recheck dip. Adjust core so that dip occurs at 29.0 volts. Clockwise rotation lowers voltage and counterclockwise rotation raises voltage.

(6) Back off regulator adjusting screw one turn. Raise generator speed to 10,000 rpm at no load. Check that dip remains the same.

Note. If instability is detected during adjustment (by a rapid series of popping noises on the earphones), it may be necessary to decrease dip to less than 3.0 volts. This will sacrifice minimum resistance and low-speed regulation characteristics and is therefore undesirable.

(7) Recheck regulation after final adjustment.

(8) Check that core is not in beyond flush position.

(9) Check that armature is not more than ½ turn out from flush (fully clockwise) position.

(10) Operate generator at 6000 rpm and set adjusting screw to middle of the dip.

h. Adjust regulator core if necessary so that peak voltage is approximately 29.0 volts.

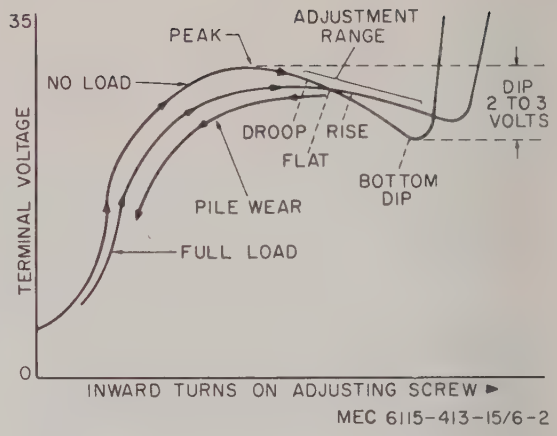


Figure 6–2. Voltage regulator, operating curve

i. Apply 200-ampere load and reset core to produce 28.0 volts output. Set adjusting screw approximately one volt past peak.

j. Perform a one-hour heat run by operating the generator at a speed of 3500 rpm and recording regulated voltage, and carbon pile voltage and current at 15-minute intervals.

k. Immediately after heat run, operate generator at a speed of 6000 rpm with 200 amperes load and set regulator core to 28.0 volts. Recheck adjusting screw dip. If less than 2 volts, repeat procedures of steps *g*(1) to *g*(10). The dip should be from 2.0 to 2.5 volts while regulator is hot. Check for flat regulation. Check regulation at no load, 100 amperes, and 200 amperes at speeds from 3500 to 10,000 rpm. Make sure that core is out (counterclockwise) from flush position.

l. Using the earphones, check for stability during preceding tests by shocking the 100 to 200-ampere load on and off. Repeat with the aircraft storage battery connected in the circuit (fig. 6–1). No instability should be detected.

Note. Do not confuse the single thud heard each time the load is shocked on and off with instability. This is a normal sound as opposed to a steady series of popping noises which indicates instability.

m. Check voltage range of potentiometer with generator operating at 6000 rpm and no load applied. Record lowest and highest readings (counterclockwise rotation should lower the voltage). The voltage must be variable from 26.0 to 30.0 volts. Set regulated voltage

to 27.7 volts, and tighten potentiometer lock nut until there is a definite drag which will still permit adjustment but which will not allow setting to change.

n. Perform a hot regulation run using values indicated in table 6–1. Adjust speed as required, apply load, and record regulated voltage.

o. After hot regulation run, measure the low value of variable resistance of the carbon pile with voltage regulator at operating temperature. The rated generator current (200 amperes) must be switched off and on continuously while the generator speed is lowered from approximately 5000 rpm until the regulated voltage is 26.5 ±0.1 volts with full load applied. Record carbon pile voltage and current. Calculate the carbon pile resistance from recorded values. The resistance must be 1.25 ohms or less.

p. While the regulator is still hot, remove it from voltage regulator base assembly. Using a-c d-c insulation tester, apply 275 volts (60 cps) between each terminal and the frame (ground) and between the equalizer coil and the operating coil (check between terminals D and G). The insulation must not break down.

Table 6–1. Voltage regulator hot regulation run

Generator Speed (rpm)	Load (amp)	Regulated Voltage (Record)
3500	0	
3500	100	
3500	200	
7000	0	
7000	100	
7000	200	
10,000	0	
10,000	100	
10,000	200	
3500	200	
3500	0	
10,000	0	
3500	0	

q. Allow the regulator to cool to room temperature.

r. With the regulator cold, connect to the setup of figure 6–1 and operate the generator at a speed of 3500 rpm. Read the regulated voltage. Apply 0.25 volt dc across equalizer coil terminals by closing the battery switch shown in figure 6–1. Make sure polarity is as indicated. Read the regulated voltage. The equalizer coil must lower the regulated voltage by 2.25 to 2.75 volts.

s. Perform a cold regulation run in the same manner as the hot regulation run of step *n*.

t. For both hot and cold regulation runs, the regulated voltage must be between 26.9 and 28.5 volts. No instability should be detected. If necessary to reset the voltage regulator, repeat both hot and cold regulation runs, and check that results are within the acceptable range.

u. If proper results cannot be obtained, disassemble and inspect for parts which require replacement.

6–4. Disassembly

Figure 6–3 is a complete exploded view of the voltage regulator. In general, disassemble in the numerical sequence indicated on figure 6–3. Special procedures and tool applications are given below:

Note. The only disassembly normally required is removal of adjusting screw (12, fig. 6–3), so that contact plugs (11 and 32) and carbon pile (23) can be replaced.

a. After removing adjusting screw (12), place the assembly on fabricated contact plug removal fixture or equivalent. Insert a rod having 3/64-inch diameter into hole in adjusting screw and tap out contact plug (11). Discard contact plug.

b. Insert a piece of drill rod having a diameter of less than 3/16 inch into carbon pile (23) and invert carbon pile housing (27) to allow pile discs to slide out. Discard carbon pile.

c. Use contact plug remover 1106028–1 to remove contact plug (32) when no other disassembly is required. Screw the removal knob of the tool against the rod knob. Insert the rod in the hole of guide tube so that the long recessed end is away from the knobs. Insert the rod through carbon pile tube (30) and carefully engage the threaded end with contact plug insert (33). Screw the rod into the insert until it is tight. Holding the rod firmly, turn the removal knob clockwise until contact plug and contact plug insert are free from ferrule (43). Remove contact plug remover and attached parts from the housing. Unscrew contact plug insert and discard contact plug.

d. If it is necessary to disassemble base as-

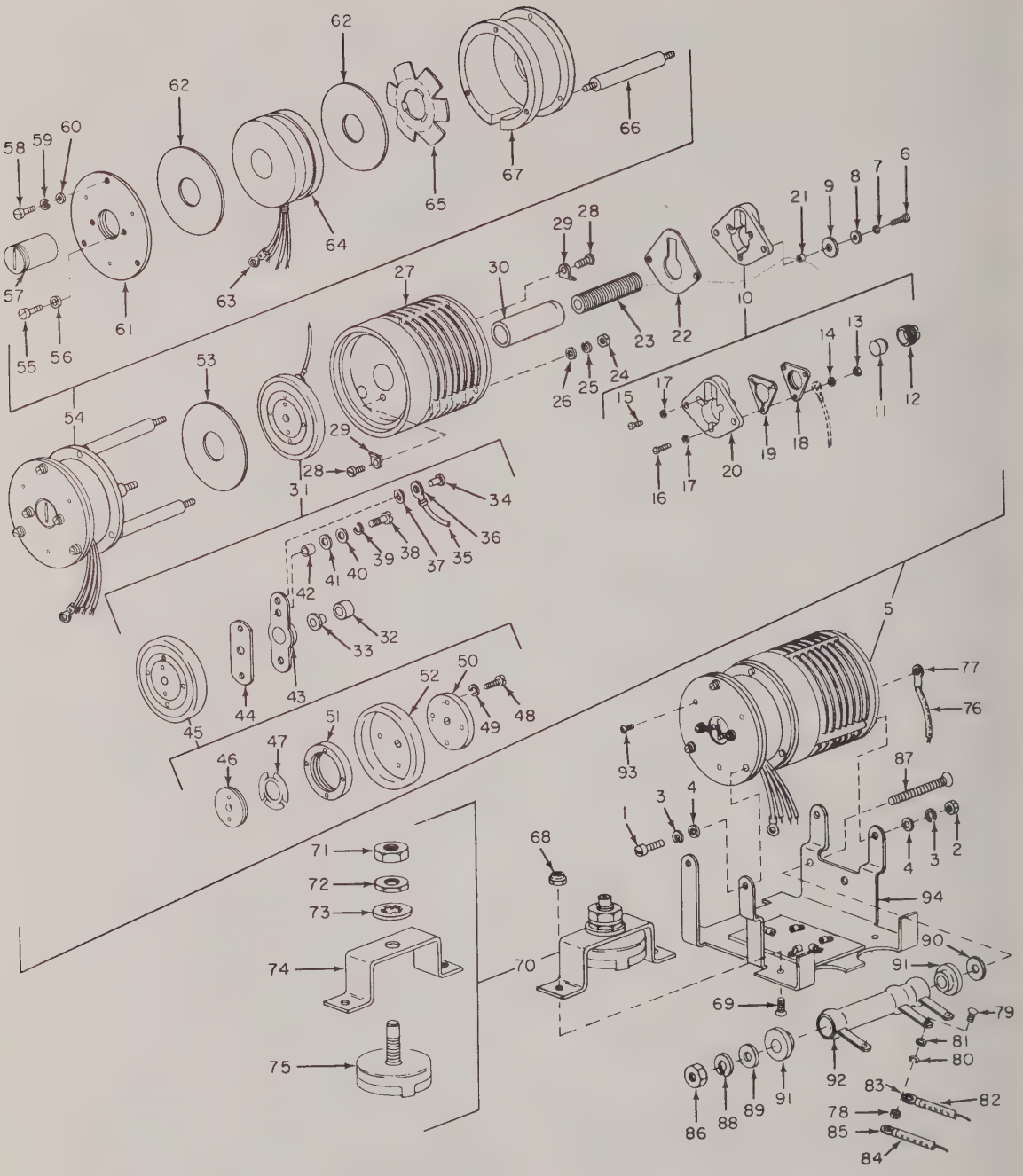


Figure 6–3. Voltage regulator, exploded view

Figure 6–3—Continued

1 Screw, fillister-hd, No. 6–32 x ½ in. (2)
2 Nut, hex, No. 6–32 (2)
3 Washer, Lock, No. 6 (4)
4 Washer, flat, No. 6 (4)
5 Carbon pile regulator
6 Screw, fillister-hd, No. 4–40 x 7/16 in. (2)
7 Washer, lock, No. 4 (2)
8 Washer, flat, No. 4 (2)
9 Insulating washer (2)
10 Adjusting screw bracket assembly
11 Contact plug
12 Adjusting screw
13 Nut, hex, No. 4–40
14 Washer, lock, No. 4
15 Screw, fillister-hd, No. 4–40 x 5/16 in. (2)
16 Screw, fillister-hd, No. 4–40 x ½ in.
17 Washer, lock, No. 4
18 Adjusting screw plate
19 Adjusting screw spring
20 Adjusting screw bracket
21 Bushing (2)
22 Insulator
23 Carbon pile
24 Nut, hex, No. 6–32
25 Washer, lock, No. 6
26 Washer, flat, No. 6
27 Carbon pile housing
28 Screw, self-tapping, binding-hd, No. 6 x ¼ in. (2)
29 Clip (2)
30 Carbon pile tube
31 Armature assembly
32 Contact plug
33 Contact plug insert
34 Eyelet
35 Lead assembly
36 Terminal lug
37 Washer, lock, internal tooth, No. 6
38 Screw, fillister-hd, No. 3–48 x ⅜ in. (2)
39 Washer, lock, No. 3 (2)
40 Washer, flat, No. 3 (2)
41 Insulating washer (2)
42 Insulating bushing (2)
43 Ferrule
44 Insulating washer
45 Armature and diaphragm assembly
46 Armature
47 Loading spring
48 Screw, fillister-hd, No. 3–48 x ¼ in. (2)
49 Washer, lock, No. 3 (2)
50 Armature washer
51 Armature ring
52 Diaphragm
53 Packing shim
54 Magnet case assembly
55 Screw, drilled fillister-hd, No. 6–32 x 3/16 in. (2)
56 Washer, flat, No. 6 (2)
57 Core
58 Screw, fillister-hd, No. 6–32 x ½ in.
59 Washer, lock, No. 6
60 Washer, flat, No. 6
61 End plate
62 Packing washer (2)
63 Solderless terminal
64 Coil assembly
65 Spring
66 Stud (3)
67 Magnet case
68 Nut, self-locking, No. 8–32 (2)
69 Screw, flat-hd, No. 8–32 x ⅜ in. (2)
70 Potentiometer and bracket assembly
71 Nut, lock ⅜–32
72 Nut, hex, ⅜–32
73 Washer, lock, internal tooth, ⅜ in.
74 Bracket
75 Potentiometer
76 Lead assembly
77 Terminal lug
78 Nut, hex, No. 4–40 (3)
79 Screw, round-hd, No. 4–40 x 5/16 in. (3)
80 Washer, lock, No. 4
81 Washer, flat, No. 4
82 Lead assembly
83 Solderless terminal
84 Lead assembly
85 Solderless terminal
86 Nut, hex, No. 8–32
87 Screw, flat-hd, No. 8–32 x 2¾ in.
88 Washer, lock, No. 8
89 Spacer
90 Insulating washer
91 Centering washer (2)
92 Dual resistor
93 Screw, self-tapping round-hd, No. 2 x ⅛ in. (3)
94 Base assembly

sembly (94) in order to replace damaged parts, see figure 6–4.

6–5. Cleaning

a. Blow out dust and dirt with clean, dry, compressed air. If necessary, use a clean lint-free cloth moistened with a solution of 50 percent isoproply alcohol and 50 percent water.

Caution: **Other solvents are not recommended since their use may damage the insulating varnish used on this equipment.**

b. If the solvent is used for cleaning, bake the parts in an oven for two hours at 250° F or for three hours at 200° F.

6–6. Inspection and Repair

a. Inspect all parts and wiring for wear and damage.

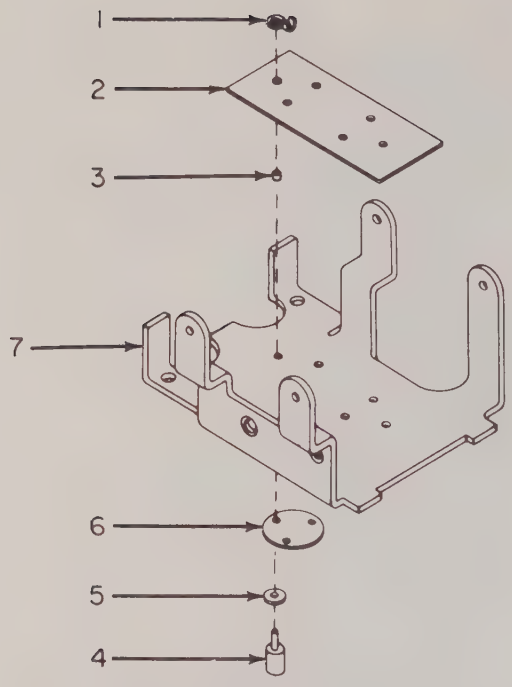
b. Inspect soldered joints for tight connections.

c. Replace all damaged parts and wiring.

d. Replace any electrical part having a value outside limits given in paragraph 6–7.

e. Replace carbon pile and both contact plugs.

f. When soldering, use a solder composed of 33 percent tin and 67 percent lead, with a melting range of 357° F to 486° F. Use a flux composed of 50 percent rosin and 50 percent ethyl alcohol or turpentine by weight.



1 Terminal lug (6)
2 Insulator
3 Insulating bushing (6)
4 Contact (6)
5 Washer (6)
6 Insulator (2)
7 Base

Figure 6–4. Base assembly, exploded view

6–7. Testing

a. Check resistance range of potentiometer (75, fig. 6–3). The resistance should vary from zero to between 4.0 and 4.8 ohms.

b. Check resistance of dual resistor (92). The resistance of the two sections should be between 18.05 and 19.95 ohms, and between 332.5 and 367.5 ohms.

c. Check resistance of coil assembly (64) windings. The resistance of the equalizer coil (yellow and green leads) should be between 0.36 and 0.44 ohm. The resistance of the operating coil (black and white leads) should be between 3.15 and 3.85 ohms.

6–8. Reassembly

Reassemble voltage regulator in reverse of numerical sequence as illustrated on figures 6–3 and 6–4. Note the following:

a. If studs (66, fig. 6–3) were replaced, star-rivet the ends of the studs after installing them in magnet case (67).

b. Screw core (57) into endplate (61) so that slotted head of core is approximately flush with endplate. Secure endplate to magnet case (67) and set core flush with inner surface of magnet case as shown in figure 6–5.

c. Install spring (65) so that the outer edges of the spring contact magnet case (67).

d. Paint a line on both the endplate (61, fig. 6–3) and core (57) to indicate the flush position.

e. When assembling armature and diaphragm assembly (45), install armature washer (50) so that the word "TOP" stamped on the face is out away from armature (46).

f. Install loading spring (47) so that the flat edge is against armature (46).

g. Position armature assembly (31) in magnet case assembly (54) as shown in figure 6–6. Make sure that packing shim (53, fig. 6–3) is installed.

h. If carbon pile tube (30) was removed or

Figure 6–5. Setting core flush with magnet case

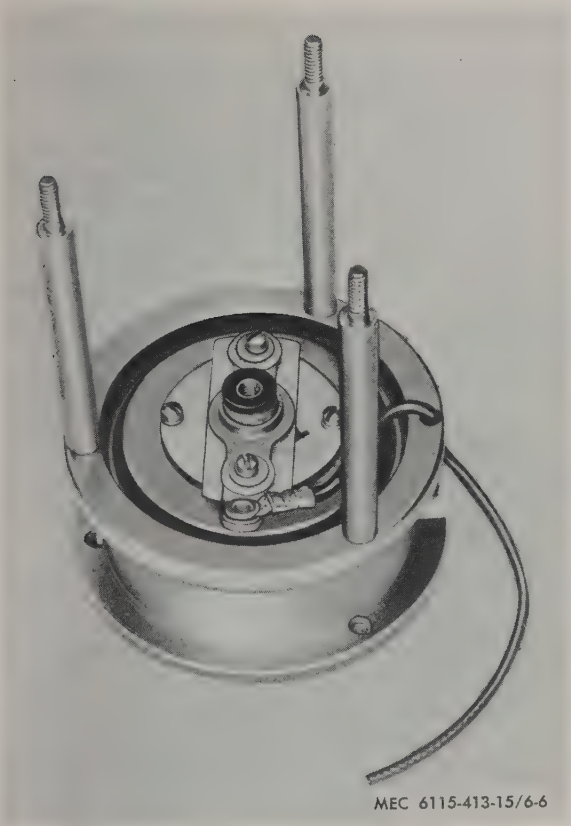


Figure 6–6. Position of armature assembly in magnet case assembly

replaced, install new carbon pile tube as follows:

(1) Make sure carbon pile housing (27) is clean.

(2) Apply Dow Corning DC–40 cement or equivalent to the inside walls of carbon pile housing. Use only a small amount of cement.

(3) Insert carbon pile tube with a slight rotary motion.

(4) Using acetone, remove excess cement from surfaces of tube and housing.

(5) With the tube in a horizontal position, bake housing in an oven for four hours at 275° F.

(6) After baking, install clips (29).

Caution: **Make sure no cement remains inside carbon pile tube.**

i. Insert a clean 3/16-inch diameter rod through new carbon pile (23) while the carbon pile is still in its container. Invert the container to allow the carbon pile discs to slide out onto the rod.

Caution: **Do not handle carbon pile discs. Do not disarrange the sequence of discs as they are matched for resistance values.**

j. Hold carbon pile housing (27) so that the axis is horizontal, and insert the rod carrying the discs into carbon pile tube (30). Turn the housing upright so the discs remain in the tube and carefully withdraw the rod.

Note. Use care to prevent contamination of the carbon pile during the remainder of the reassembly sequence.

k. Install new contact plug (11) in adjusting screw (12).

l. Attach adjusting screw (12) to adjusting screw plate (18). If the adjusting screw sticks during assembly, remove the adjusting screw. Clean all metal particles from screw threads with a scriber and apply pencil lead to the threads as a lubricant to prevent seizure.

m. Install adjusting screw spring (19) tightly on threads of adjusting screw (12), then back off adjusting screw spring just enough to line up mounting holes with those of adjusting screw plate (18). This position provides minimum locking effect of the spring. Additional locking effect can be obtained by backing off the spring an additional 1/3 turn (120 degrees).

Note. Make sure that adjusting screw (12) can be readily turned with a screwdriver, but enough resistance is present to prevent accidental movement from changing the adjusting screw setting.

n. When assembling adjusting screw bracket assembly (10), use the longer screw (16) to attach lead assembly (76) with nut (13).

o. When attaching adjusting screw bracket assembly (10) to carbon pile housing (27), tighten screws (6) evenly and carefully to avoid cracking bushings (21). If any cracking is heard or felt, remove the screws and check bushings for damage.

6–9. Installation

Install voltage regulator (para 3–49).

Section II. STARTER GENERATOR

6–10. General

This section contains complete repair instructions for the starter generator. This dc generator is used to start the engine, and to generate the output voltage to the voltage regulator.

6–11. Removal

Remove the starter generator as described in paragraph 5–14.

6–12. Bench Testing

a. Test Conditions.

(1) *Mounting.* Mount the starter generator on a suitable varidrive unit or aircraft generator test stand capable of driving the starter generator through the rated speed range of 5000 to 11,000 rpm. The starter generator must be mounted so that the longitudinal axis is horizontal, and must be driven in a counterclockwise direction as viewed from the drive shaft end.

(2) *Temperature.* The ambient temperature during tests must be between 50° F and 104° F.

(3) *Load.* Locate the starter generator load so that it does not affect the ambient temperature. Use a load bank having graduated load steps and a minimum continuous rating of 300 amperes at 30 volts.

(4) *Brush access cover.* It is recommended that a brush access cover with plastic windows be used during brush seating and commutation tests. A spare cover can be modified in the shop by cutting square windows in such a position that the commutator and electrical contact brushes are visible. Rivet nonflammable transparent plastic window panes on the cover.

Caution: **If a suitable brush access cover cannot be obtained, it is permissible to remove the brush access cover for observation of commutation; however, do not run the generator in this manner for longer than 3 to 4 minutes, or overheating may result.**

(5) *Excitation.* The starter generator shall be self-excited and controlled by a suitable variable resistance connected in series with the shunt field (terminals A and B on starter generator terminal board). The shunt field current is not to be considered as part of generator load current.

(6) *Test connections.* Connect the starter generator as shown in figure 6–7.

b. Electrical Contact Brush Seating.

Note. Perform this procedure if new electrical contact brushes have been installed or if the position of dc endbell assembly was shifted.

(1) Drive the starter generator at rated speed of 5000 rpm.

(2) Close load switch (fig. 6–7) and apply a load of 100 amperes.

(3) Allow the starter generator to operate until periodic examination of the electrical contact brushes indicates that the face of each brush contacts the commutator surface 100 percent in the direction of rotation and at least 75 percent of the brush dimension parallel to the shaft (fig. 6–8).

Note. When electrical contact brushes are removed for inspection, be sure to return each brush to the holder from which it was removed.

(4) There must be no evidence of grooving or other surface damage to the face of the electrical contact brushes.

(5) No sparking should occur at the brushes, although slight pinpointing is permissible.

(6) If seating is close to requirements, it is permissible to increase the load current to 200 amperes for short periods, until the brushes are properly seated.

(7) When brush seating is completed, open the load switch and stop the starter generator. Allow the unit to cool before proceeding.

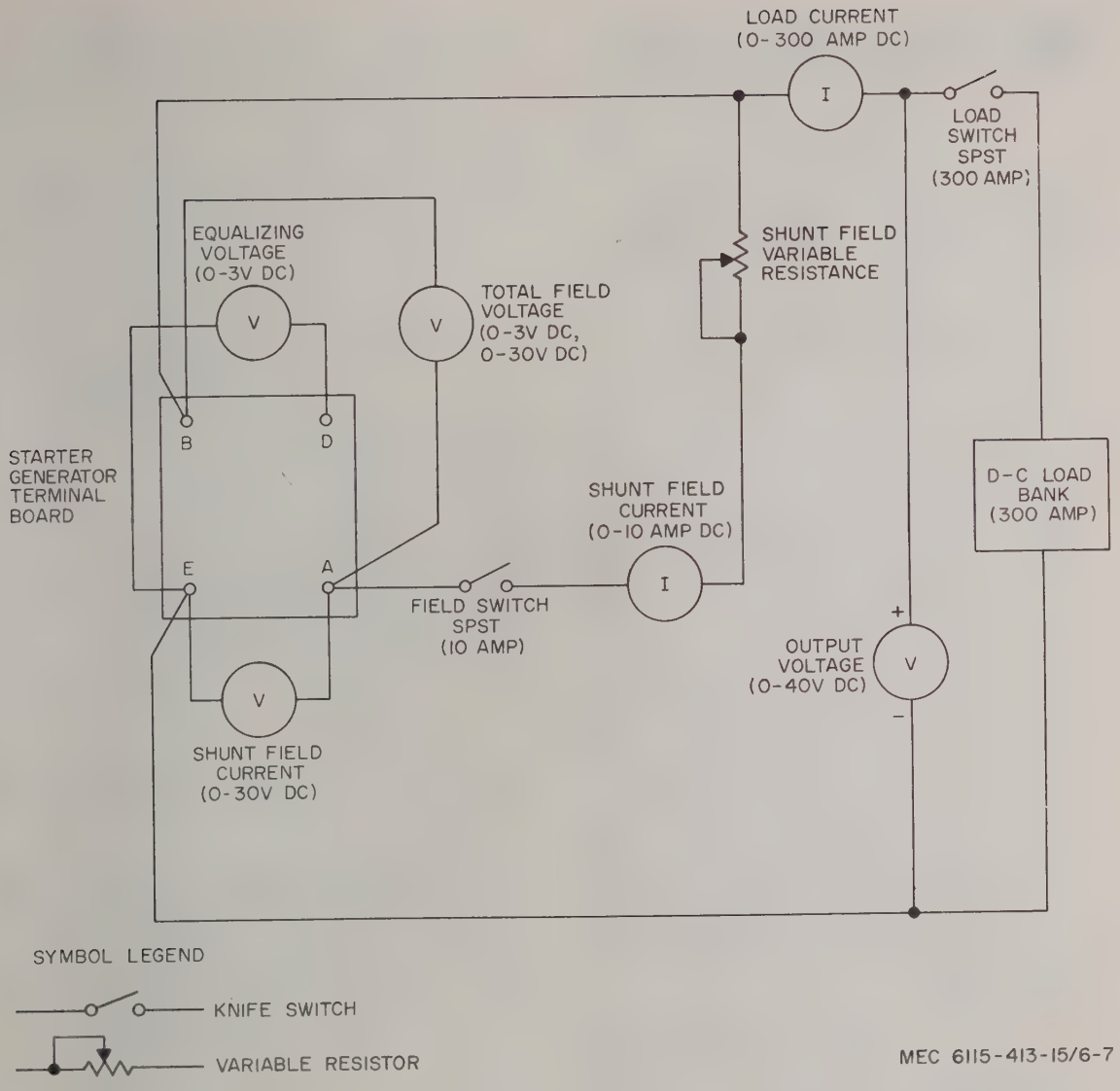


Figure 6–7. Starter generator, test connections

c. Tests.

(1) *Maximum speed for regulation.*

Note. Perform this test at room temperature. Do not run an operational warmup on the starter generator for this test only.

(*a*) Close field switch (fig. 6–7) and leave load switch open.

(*b*) Drive the starter generator at 10,000 rpm.

(*c*) Adjust shunt field variable resistance (fig. 6–7) until output voltmeter reads 30 volts.

(*d*) Set total field voltmeter (fig. 6–7) range to 0–3 volts.

Caution: **For all other tests, set the range to 0–30 volts.**

(*e*) Record the readings of the total field voltmeter and shunt field ammeter.

(*f*) Calculate the external field circuit

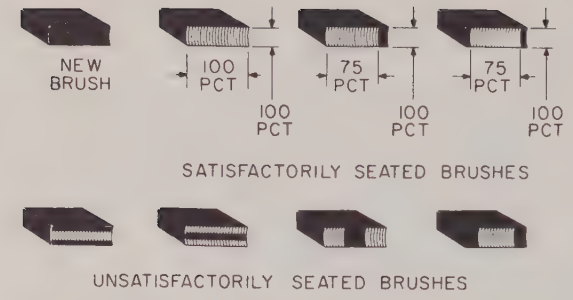


Figure 6–8. Typical electrical contact brush seating

resistance by dividing the voltmeter reading by the ammeter reading. The result must not exceed 35 ohms, with the starter generator supplying 30 volts at no load.

(*g*) Set total field voltmeter range to 0–30 volts for remainder of tests.

(*h*) Drive the starter generator at 6500 rpm (continuous operating speed).

(*i*) Close load switch (fig. 6–7) and apply rated load of 300 amperes.

(*j*) Allow the starter generator to run for a sufficient time to allow it to reach substantially constant temperature (when shunt field temperature does not increase by more than 2° F during a 5-minute period).

Note. The preceding steps provide an operational warmup for the starter generator.

(2) *Heating, commutation, minimum speed, and equalizing voltage.*

(*a*) Check that the starter generator is running at a speed of 6500 rpm with full rated load of 300 amperes applied. Make sure that the starter generator shunt field temperature has stabilized as described in paragraph 6–12 *c*(1).

(*b*) Check meter readings. The output voltage must be 30 volts; load current must be 300 amperes; shunt field current must not exceed 8 amperes; equalizing voltage must be between 1.9 and 2.1 volts; and total field voltage reading divided by shunt field current must not be less than 1.25 ohms (external field circuit resistance).

(*c*) Increase the starter generator speed to 8000 rpm and adjust shunt field resistance until output voltage is 30 volts. Check meter readings as described in step (*b*) above. Results must be the same.

(*d*) Reduce the starter generator speed to 5000 rpm and adjust shunt field resistance until output voltage is 26 volts. Check meter readings as described in step (*b*) above. Results must be the same.

(*e*) Perform a commutation and compounding test at the values given in table 6–2. During the tests, use the modified plastic brush access cover described in paragraph 6–12*a*(4) to observe the commutator. There should be no more than fine pinpoint sparking at the electrical contact brushes.

(3) *Overspeed.*

(*a*) Perform this test while the starter generator is hot as a result of previous tests.

(*b*) Open load and field switches (fig. 6–7) and drive generator at a speed of 11,000 rpm for 5 minutes.

(*c*) The starter generator should show no evidence of mechanical failure throwing of varnish, or impairment of electrical performance.

Table 6–2. Commutation and Compounding Test Values

Speed (Rpm)	Output Voltage (Volts)	Load Current (Amp)	Record Field Voltage (Volts)	Field Current (Amp)
5000	30	0		*
5000	30	150		*
5000	30	300		*
6500	30	0		*
6500	30	150		*
6500	30	300		*
8000	30	0		*
8000	30	150		*
8000	30	300		*

*At any given speed, an increase in load current must reflect an increase in field current. If this does not occur, refer to paragraph 6–17*c*(15) for adjustment of dc endbell assembly position.

(*d*) Reduce the speed to 6500 rpm, close the field and load switches, and apply rated load of 300 amperes.

(*e*) Operate at 30 volts output with rated load applied for one minute and check electrical performance. Results should compare closely with those observed in paragraph 6–12*c*(2).

(4) *Dielectric strength.*

(*a*) Perform this test while the starter generator is hot as a result of previous tests.

(*b*) Remove all external connections from starter generator terminal board, and disconnect terminals of capacitors (27 and 30, fig. 6–9).

(*c*) Using a suitable insulation tester, apply 250 volts ac (60 cps) between the frame (ground) and each terminal (A, B, D, and E) in turn. There must be no insulation breakdown or leakage current in excess of 2 milliamperes.

(*d*) Reconnect capacitor terminals.

(5) *Polarity check.*

(*a*) Reconnect the starter generator and drive it at a speed of 6500 rpm with rated load of 300 amperes applied.

(*b*) Check the output voltage reading on the meter connected across terminals B and E. If the meter leads must be reversed in order to obtain a reading, the polarity of the starter generator is reversed. If this is the case, flash the field as described in paragraph 3–51.

6–13. Disassembly

Figures 6–9 through 6–11 represent the complete exploded views of the starter generator. In general, disassemble in the numerical sequence indicated on the figures. Special procedures and tool applications are given below:

a. Main Assembly.

(1) Remove terminal block cover (1, fig. 6–9) if it is installed.

(2) Loosen screw (3) to spread brush access cover (4), and slide the brush access cover off the fan end.

(3) Remove eight screws (5) and lift out electrical contact brushes. Inspect condition of brushes. If the wear line is not visible (total length less than 9/16 inch), discard the brushes.

Note. If complete overhaul is to be performed, discard electrical contact brushes regardless of condition, and proceed as follows:

(4) Remove endbell cover assembly (12).

(5) Using a suitable splined wrench to keep drive shaft assembly (17) from turning, remove self-locking nut (13).

(6) Remove flat washer (14), compression spring (15), and fan (16). Remove drive shaft assembly (17) and front plate (18).

(7) Disconnect terminals of capacitors (27 and 30) from threaded holes in cap screws of dc endbell assembly (37).

(8) Remove capacitors (27 and 30).

(9) Remove screws (31) to free bearing retainer (43).

(10) Using a pair of retaining ring pliers, remove retaining rings (35 and 40).

(11) Drive roll pin (34) through dc endbell assembly (37) into generator stator assembly (46).

(12) Using a suitable screwdriver press and puller, remove dc endbell assembly (37). Refer to paragraph 6–13*b* if disassembly is required.

(13) Press armature (44) with ball bearings (38 and 42) attached, out of the open end of generator stator assembly (46).

(14) Using a suitable bearing puller, remove ball bearings (38 and 42) from armature (44).

(15) Refer to paragraph 6–13*c* if disassembly of generator stator assembly (46) is required.

b. DC Endbell Assembly. Do not disassemble dc endbell assembly unless replacement of damaged parts is required. If disassembly is required, see figure 6–10 for sequence.

c. Generator Stator Assembly. Do not disassemble generator stator assembly unless replacement of damaged parts is required. If disassembly is required, see figure 6–11 for sequence.

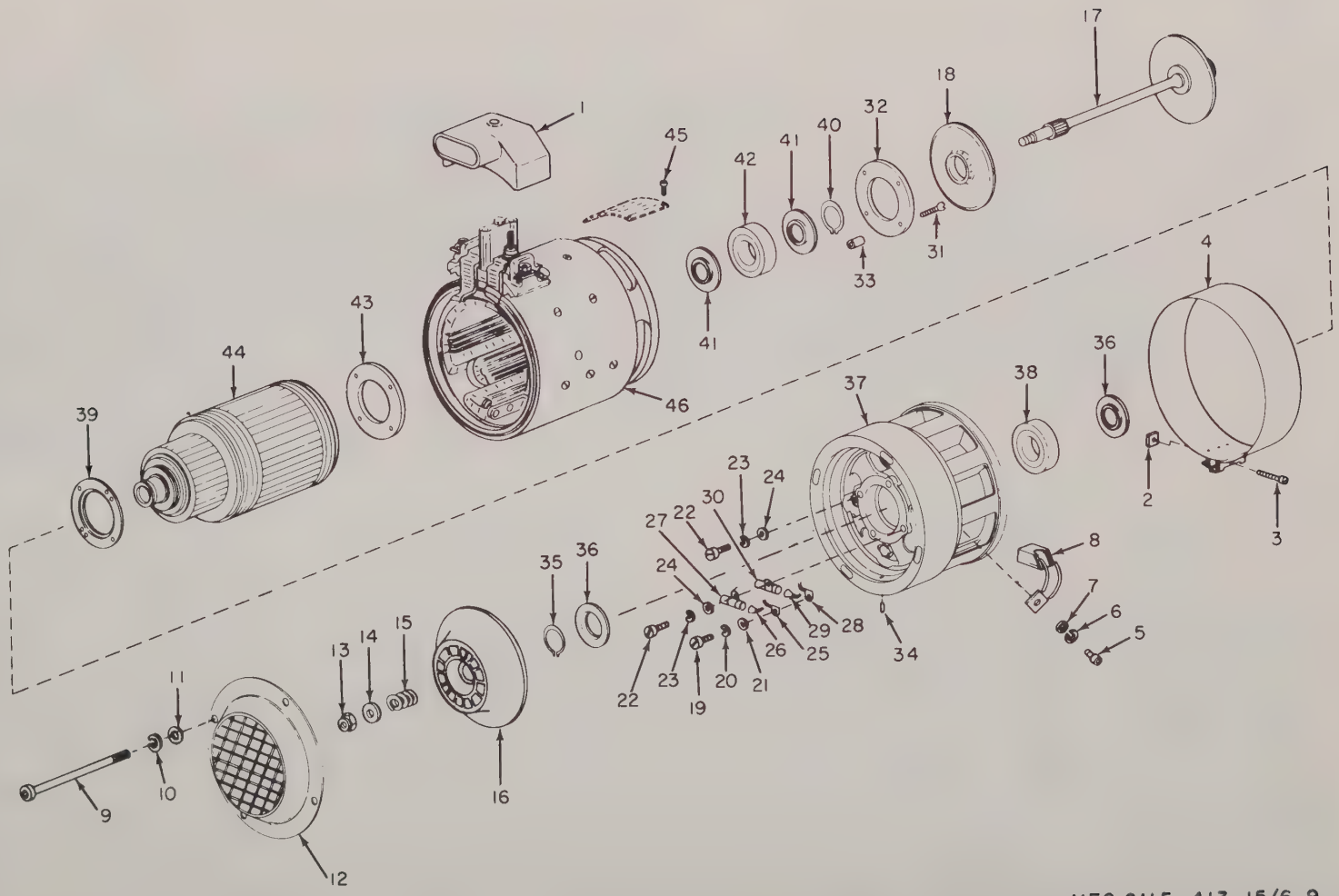


Figure 6–9. Starter generator main assembly, exploded view

Figure 6–9—Continued

1 Terminal block cover
2 Nut, square, No. 10–32
3 Screw, fillister-hd, No. 10–32 x 1¼ in.
4 Brush access cover
5 Screw, socket-hd cap, ¼–28 x ½ in. (8)
6 Washer, lock, ¼ in. (8)
7 Washer, flat, ¼ in. (8)
8 Electrical contact brush (8)
9 Screw, socket-hd cap, ¼–20 x 5¼ in. (4).
10 Washer, lock, ¼ in. (4)
11 Washer, flat, ¼ in. (4)
12 Endbell cover assembly
13 Nut, self-locking, 5/16–24
14 Washer, flat, 5/16 in.
15 Compression spring
16 Fan
17 Drive shaft assembly
18 Front plate
19 Screw, fillister-hd, No. 6–32 x ¼ in. (2)
20 Washer, lock, No. 6 (2)
21 Washer, flat, No. 6 (2)
22 Screw, fillister-hd, No. 8–32 x 1 in. (4)
23 Washer, lock, No. 8 (4)
24 Washer, flat, No. 8 (2)
25 Terminal (2)
26 Cable nipple (2)
27 Capacitor (2)
28 Terminal (2)
29 Cable nipple (2)
30 Capacitor (2)
31 Screw, flat-hd, No. 8–32 x 15/16 in. (4)
32 Bearing retainer
33 Bushing (4 rqr)
34 Roll pin
35 Retaining ring
36 Dirt slinger (2)
37 DC endbell assembly
38 Ball bearing
39 Bearing retainer
40 Retaining ring
41 Dirt slinger
42 Ball bearing
43 Bearing retainer
44 Armature
45 Screw, self-tapping, round-hd, No. 4 x 3/16 in. (2)
46 Generator stator assembly

Note. If removal of winding and pole shoe assembly (16, fig. 6–11) is required, use a suitable screwdriver press and screwdriver bit to remove staked screws (15).

6–14. Cleaning

a. General.

(1) Use a cleaning solution composed of 50 percent isopropyl alcohol (Specification MIL–F–5566) and 50 percent water.

(2) Ultrasonic cleaning equipment may be used if available. Consult the manufacturer of this equipment for proper cleaning solutions and methods to be used for silicone insulation varnish.

Caution: **Other solvents are not recommended since their use may damage the insulation varnish used on this equipment.**

b. Armature and Generator Stator Assembly.

(1) Be sure that all carbon and copper particles are removed from the area between the commutator bars of the armature and the windings of the generator stator assembly. Use a stiff, non-wire brush if required.

(2) Bake the armature and generator stator assembly in an oven for 2 hours at 250° C to thoroughly dry the parts.

c. Corrosion Prevention. Apply a light film of oil (Specification MIL–L–7870) or anti-corrosion preparation to all ferrous-metal surfaces to prevent rusting.

Caution: **Do not apply oil to the commutator surface.**

6–15. Inspection and Repair

a. Visually inspect all parts and wiring for wear, distortion, cracks, and discoloration.

b. Examine all screw threads and tapped holes for stripped and burred threads.

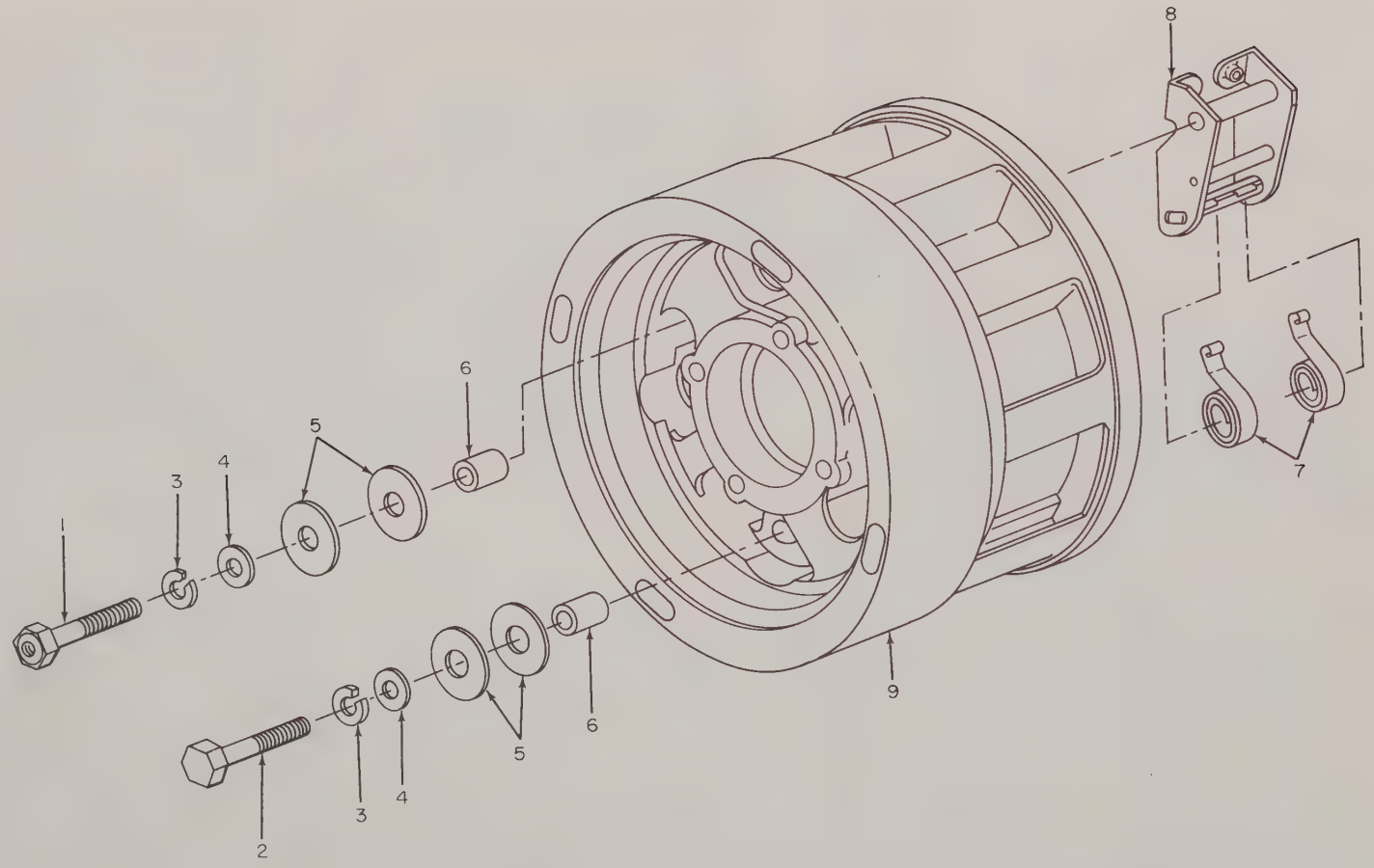
c. Replace all worn and damaged parts if a repair procedure is not provided.

d. Armature.

(1) Inspect for loose and misaligned commutator bars.

(2) Inspect banding wire for tight, firmly brazed connections.

(3) Inspect commutator contact surface. An even, highly burnished, dark color indicates satisfactory condition. If the contact surface is rough, pitted, burned, or covered with a hardened film of carbon or oil which cleaning does not remove, resurface the commutator. Use a diamond-tipped cutting tool (fig. 6–12) if possible, and mount the point of the tool on the centerline of the armature (fig. 6–13). The minimum diameter to which the commutator may be turned down is 2.800 inches, and is indicated by a step cut into the side of the commutator. Make the final cut at a surface



MEC 6115-413-15/6-10

Figure 6–10. DC endbell assembly, exploded view

Figure 6–10—Continued

1 Screw, cap, tapped hex-hd, 5/16–18 x 1¼ in. (2)
2 Screw, cap, hex-hd, 5/16-18 x 1¼ in. (2)
3 Washer, lock, 5/16 in. (4)
4 Washer, flat, 5/16 in. (4)
5 Insulating washer (16)
6 Insulating tube (4)
7 Brush spring (8)
8 Electrical contact holder (4)
9 Endbell

speed of 600 surface feet per minute to remove burrs.

Note. If the commutator was resurfaced, reclean as described in paragraph 6–14.

(4) Check the undercutting between commutator bars. If the depth is less than 1/32 inch, undercut the mica to this depth and to a width of 0.030 inch.

(5) Check armature for static and dynamic balance. If out of balance by more than 0.020 inch, rebalance by adding leaded epoxy to core openings as required.

e. Generator Stator Assembly.

(1) Inspect all leads and windings for damaged insulation.

(2) Using a suitable plug gage, check for a clearance between opposite pole shoes of 4.273 inches minimum. If clearance is incorrect, use a suitable pole shoe expander to increase the clearance, and tighten screws (15, fig. 6–11) to a torque of 35 to 40 inch-pounds before staking each screw in two places.

f. Drive Shaft Assembly.

(1) Using a graduated microscope, check the splines for wear by measuring the "top land" of each tooth. If the top land dimension of the teeth on the drive end spline is less than 0.025 inch, or if less than 0.030 inch on the smaller (commutator end) spline, replace the drive shaft assembly.

(2) Inspect the drive shaft assembly for indications of overheating. Bear in mind that although discoloration may indicate a weakened shaft, this condition can be present in a sound shaft. Disregard uniform discoloration along the pencil section of the shaft; if however, localized or blotchy discoloration is noted, overheating may be indicated.

(3) If slight blueing is observed, the drive shaft assembly may still be serviceable, provided a magnetic particle inspection (Specification MIL–I–6868) reveals no surface cracks.

(4) If black discoloration is observed, discard the drive shaft assembly. Check for the cause of this condition, such as overload or excessive vibration.

6–16. Testing

a. Check compression spring (15, fig. 6–9) by compressing to a length of 0.875 inch. The load at this length must be between 180 and 200 pounds.

b. Check armature for insulation breakdown by applying 300 volts at 60 cycles per second for one second between shaft and commutator. Replace the armature if the insulation breaks down.

Caution: **Keep test probes outside the brush path to avoid damaging the commutator contact surface.**

c. Refer to TM 5–764 to test armature for short circuits.

d. Check generator stator assembly for insulation breakdown by applying 300 volts at 60 cycles per second for one second between any winding and the frame. Replace the winding and pole shoe assembly if the insulation breaks down.

6–17. Reassembly

a. Generator Stator Assembly. See figure 6–11 and reassemble generator stator assembly if it was disassembled.

(1) Place insulators (17, fig. 6–11) behind each compensating winding of winding and pole shoe assembly (16).

(2) After installing winding and pole shoe assembly (16), tighten screws

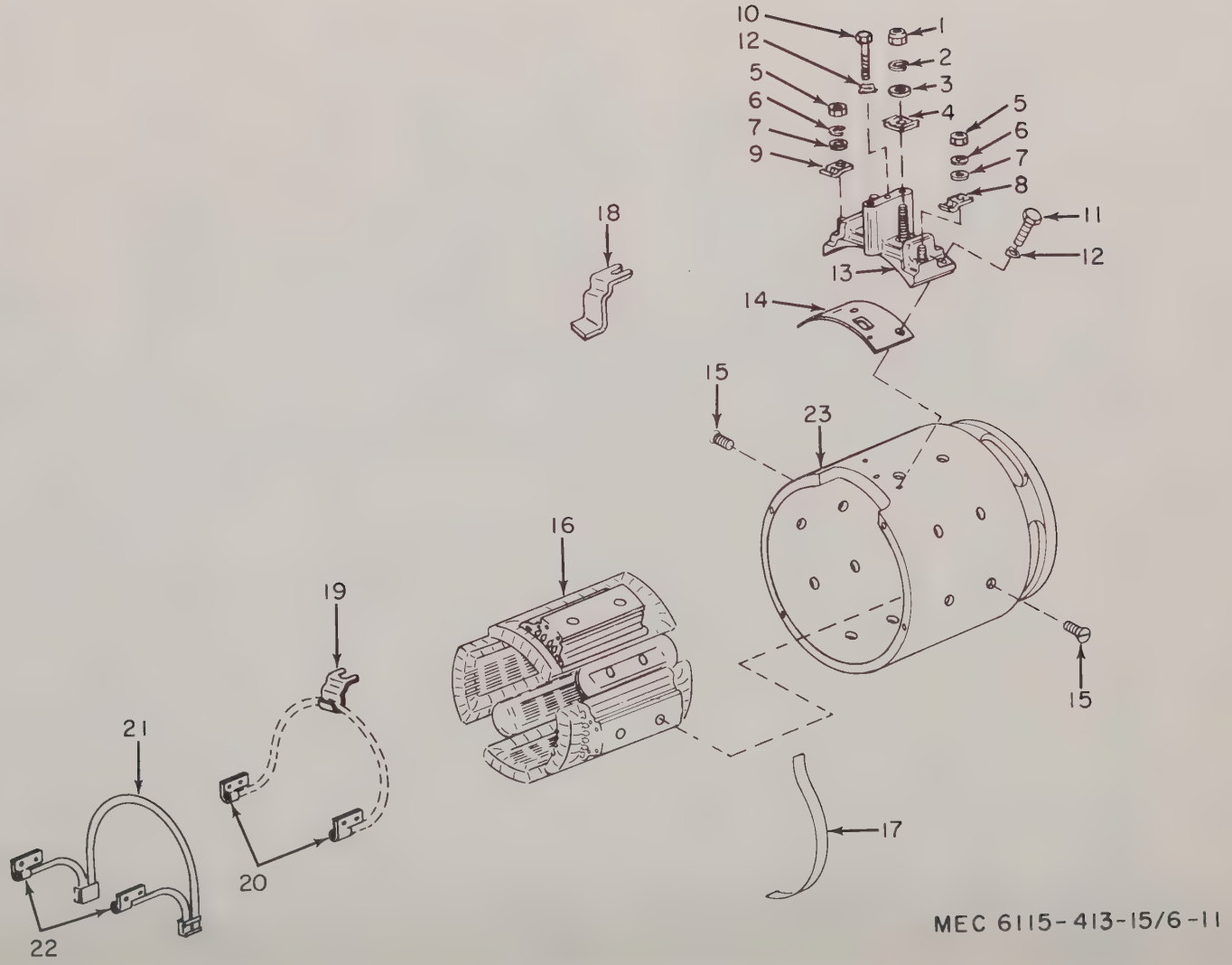


Figure 6–11. Generator stator assembly, exploded view

Figure 6–11—Continued

1 Nut, self-locking, ⅜–24 (2)
2 Washer, lock, ⅜ in. (2)
3 Washer, flat, ⅜ in. (2)
4 Terminal plate (2)
5 Nut, self-locking, No. 10–32 (2)
6 Washer, lock, No. 10 (2)
7 Washer, flat, No. 10 (2)
8 Terminal
9 Terminal
10 Bolt, hex-hd, No. 10–32 x 2 13/32 in.
11 Bolt, hex-hd, No. 10–32 x 25/32 in. (2)
12 Washer, flat, No. 10 (3)
13 Terminal board
14 Terminal board insulator (3)
15 Screw, flat-hd, No. 10–24 x 9/16 in. (16)
16 Winding and pole shoe assembly
17 Insulator (4)
18 Electrical lead ("E" post)
19 Terminal lug ("B" post)
20 Terminal lug (2)
21 Electrical lead assembly
22 Terminal lug (2)
23 Housing

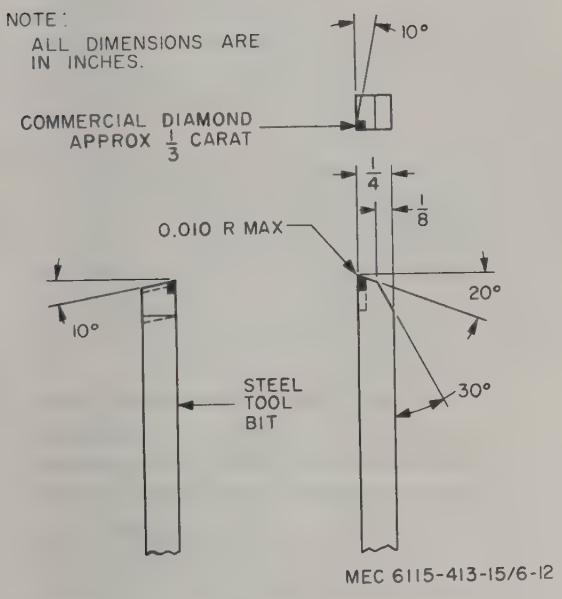


Figure 6–12. Typical diamond-tipped commutator cutting tool

(15) to a torque of 40 inch-pounds, and recheck clearance as specified in paragraph 6–15*e*.

(3) If any terminals were removed from leads, braze terminals to leads in accordance with Specification MIL–B–7883.

(4) Make sure terminal lug (19) is connected to the "B" terminal post. Terminal lugs (20) will be connected to the positive brush holders when the unit is assembled.

(5) Make sure electrical lead (18) is connected to the "E" terminal post, and brazed to the shunt and compensating windings.

Note. See figure 1–5 for wiring connections.

(6) Tighten bolts (10 and 11, fig. 6–11) to a torque of 35 to 40 inch-pounds.

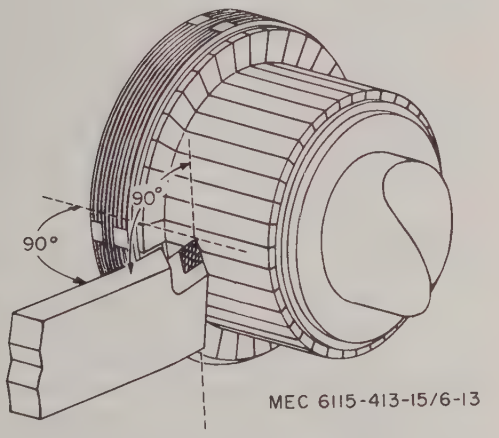


Figure 6–13. Mounting of commutator cutting tool

b. DC Endbell Assembly. See figure 6–10 and reassemble dc endbell assembly if it was disassembled.

(1) If electrical contact holders (8, fig. 6–10) were removed, coat both edges of the bosses on endbell (9) with red Glyptal lacquer.

(2) Make sure tapped screws (1) are installed in the positive brush holders.

(3) Bake the assembled parts in an oven at 350° F for 2 hours.

(4) Retighten screws (1 and 2) to a torque of 75 to 80 inch-pounds after baking.

c. Main Assembly. See figure 6–9 and reassemble the starter generator main assembly. Follow the procedure given below:

(1) Mount bearing retainers (39 and 43, fig. 6–9) on proper ends of armature (44). Install one slinger (36 and 41) on each end of the armature.

(2) Heat ball bearings (38 and 42) to 250° F. Using a suitable bearing pusher, install the ball bearings on the shaft of armature (44).

(3) Install remaining slingers (36 and 41) and retaining rings (35 and 40).

(4) Secure capacitors (27 and 30) to dc endbell assembly (37). Note that bearing retainer (39) must be positioned to properly receive screws (22). Make sure each pair of terminals (25 and 28) are connected to tapped heads of endbell screws (positive brush holders).

(5) Using a suitable screwdriver press and pusher, insert armature (44) with ball bearings installed into generator stator assembly (46).

(6) Using a suitable screwdriver press and head puller, install dc endbell assembly (37) over ball bearing (38). Make sure mounting holes are alined with those of generator stator assembly.

(7) Insert bushings (33) into holes of generator stator assembly (46).

(8) Place bearing retainer (32) over ball bearing (42). Aline screw holes in bearing retainers (43 and 32), and install screws (31).

(9) Mount front plate (18) on drive shaft assembly (17), and insert the drive shaft assembly through armature (44).

(10) Install fan (16) between drive shaft assembly (17) and shaft of armature (44).

(11) Install compression spring (15) and flat washer (14). Using a suitable splined wrench to keep drive shaft assembly (17) from turning, install and tighten self-locking nut (13).

(12) Install endbell cover assembly (12).

(13) Use a suitable tool to lift up endbell brush springs, and install electrical contact brushes (8), making sure to engage terminal lugs of generator stator assembly with each brush holder of dc endbell assembly (37). Install brush access cover (4).

(14) Only if the winding and pole shoe assembly was not replaced, insert roll pin (34) through the existing hole in dc endbell assembly (37) into generator stator assembly (46) until it is flush.

(15) If the winding and pole shoe assembly was replaced, or if the commutation and compounding test results were not satisfactory, adjust the dc endbell assembly position as described in steps (16) through (20).

(16) Loosen screws (9) enough so that the dc endbell assembly (37) position can be shifted.

(17) Shift the position of dc endbell assembly (37) very slightly, either clockwise or counterclockwise as required.

Caution: **Do not shift the position more than is necessary, or minimum speed characteristics of the starter generator may be adversely affected.**

(18) Tighten screws (9) securely and repeat the test procedure to verify that results are satisfactory.

Note. Brushes must be reseated if adjustment is made.

(19) When test results are satisfactory, drill a 0.062 to 0.065 inch diameter hole through the housing flange of generator stator assembly (46), through the pilot hole in dc endbell assembly (37).

(20) Insert roll pin (34) through the hole in dc endbell assembly (37) and generator stator assembly (46) until it is flush with the outside surface.

6–18. Installation

Install the starter generator as described in paragraph 5–14*b*.

6–19. General

This section contains repair instructions for the basic engine components. Accessory items such as the carburetor, fuel pump, and magneto are covered in subsequent sections. See figure 6–14 for a location view of the basic engine components.

6–20. Removal

a. Engage lifting bracket eyebolt with a crane.

b. Remove four sets of cap screws, nuts, and washers from the two engine supports, and lift the engine and base assembly from the base and wheel assembly.

6–21. Disassembly

a. General. The engine lends itself to breakdown into various functional groupings. These groupings are shown in figures 6–15 through 6–23.

b. Oil Filter, Air Shrouds, and Air Cleaner Group. See figure 6–15 and disassemble the oil filter, air shrouds, and air cleaner, if these parts are still attached to the engine.

c. Magneto and Gear Cover Group. See figure 6–16 and disassemble the magneto and gear cover group. Use a hammer to drive out the two dowel pins (15). Refer to Section VI for coverage on magneto (7).

d. Governor Assembly. See figure 6–17 and disassemble the governor assembly.

e. Manifold and Crankcase Group. See figure 6–18 and disassemble the manifold and crankcase group. Refer to Section IV for coverage on carburetor (21).

f. Crankshaft, Pistons, and Connecting Rod Group. See figure 6–19 and disassemble the crankshaft, pistons, and connecting rod group. Keep bearing plate shims (11 and 13) in place, and record thickness of bearing plate gaskets (10 and 12) before discarding them. If the same thickness of shims and gaskets is used during reassembly, the end play requirement (0.002 to 0.004 inch) will be met, since there is so little wear in the bearings that readjustment should not be required.

g. Camshaft and Fuel Pump Mounting Group. See figure 6–20 and disassemble the camshaft and fuel pump mounting group. Parts of fuel strainer (3) are shown in figure 3–10. Refer to Section V for coverage on fuel pump (7, fig. 6–20).

h. Idler Gear and Oil Filler Mounting Group. See figure 6–21 and disassemble the idler gear and oil filler mounting group. Use a gear puller to remove idler gear (12) and idler gear stud (11).

i. Cylinder Block Assembly. See figure 6–22 and disassemble the cylinder block assembly. Note the following:

(1) On each valve, compress valve spring (8) and remove rotator cap (11) and valve spring seat locks (10). Release spring and remove valve (5), spring, and valve spring seat (9).

(2) Tag each valve (5) so at reassembly they will be inserted into the same valve guides (7).

(3) Do not press out valve guides (7) at this time.

j. Oil Pump Assembly. See figure 6–23 and disassemble the oil pump assembly. Using a soft brass rod or punch, press drive shaft (18) out of oil pump drive gear (4), and remove assembled oil pump from crankcase assembly (44, fig. 6–18).

6–22. Cleaning

Clean all engine parts using approved solvents. Remove all carbon and lead deposits from cylinder block (20, fig. 6–14), pistons (23, fig. 6–19), valves (5, fig. 6–22) and cylinder head (19, fig. 6–14). Use compressed air to clear out oil passages.

6–23. Inspection and Repair

a. General. Inspect the engine parts for evidence of damage and wear. Replace all damaged parts. The following steps list critical inspection and repair procedures.

b. Crankshaft, Pistons, and Connecting Rod Group. Inspect crankshaft, pistons, and connecting rod group as follows:

(1) Inspect crank pins of crankshaft (35, fig. 6–19) for the dimensions shown in figure 6–24.

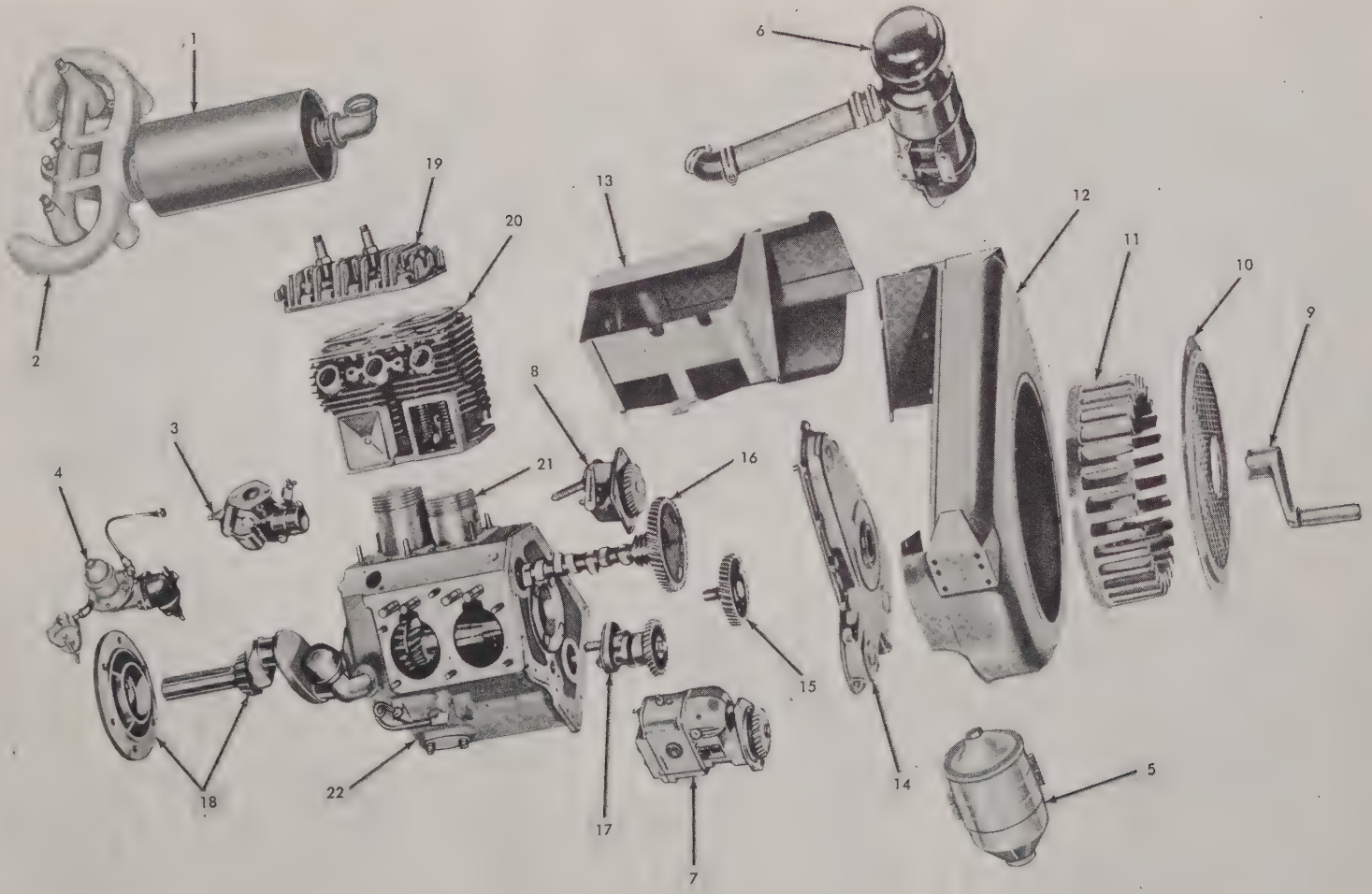


Figure 6–14. Basic engine components, location view

Figure 6–14—Continued

1 Muffler
2 Exhaust manifold
3 Carburetor (Sec. IV)
4 Fuel pump (Sec. V)
5 Oil filter
6 Air cleaner
7 Magneto (Sec. VI)
8 Governor assembly
9 Starting hand crank
10 Flywheel screen
11 Flywheel
12 Flywheel shroud
13 Air shroud
14 Gear cover
15 Idler gear
16 Camshaft and gear
17 Oil pump assembly
18 Main bearing plate and crankshaft assembly
19 Cylinder head
20 Cylinder block
21 Pistons and connecting rods
22 Crankcase assembly

(2) Inspect pistons (23, fig. 6–19) for wear. Replace if they are scored, have excessive wear patterns, or have machining marks obliterated.

Note. If cylinders of cylinder block (14, fig. 6–22) have been reground (para 6–23*c*), oversized pistons (23, fig. 6–19), piston compression rings (18), piston scraper rings (19), and piston oil rings (20) must be used.

c. Cylinder Block Assembly. Inspect cylinder block assembly as follows:

(1) Inspect cylinder blocks (14, fig. 6–22) for cracks, porous spots, and scored sealing surfaces.

(2) Measure diameter of cylinder block (14). If cylinders are worn more than 0.005 inch oversize, regrind cylinders and fit with oversized pistons (23, fig. 6–19) and piston rings (18, 19, and 20). If cylinders are worn too far to use largest (0.040 inch) oversized pistons and rings, replace cylinder blocks.

(3) Inspect valves (5, fig. 6–22) and valve seat inserts (6) for signs of overheating, cracks, and distortion. Replace if damaged.

(4) Measure clearance between stems of valves (5) and valve guides (7). If clearance exceeds 0.008 inch, press out and replace valve guides.

(5) Grind serviceable valves (5) and valve seat inserts (6) to an angle of 45 degrees to the vertical center lines. After grinding, lap the valves and valve seat inserts with suitable lapping compound, to provide proper fit. Clean the valves and apply lapping compound to the valve faces. Insert the valves in their valve guides (7) and lap by rotating the valves back and forth with a reciprocating advancing valve tool. Occasionally lift the valves and reseat them in a different position to insure uniform seating. After valves are properly lapped, remove them from the cylinder block and wash valves and block thoroughly with an approved cleaning solvent. Tag each lapped valve with its mated valve guide for proper assembly.

6–24. Reassembly

a. General. See figures 6–15 through 6–23 and reassemble the engine. Note the following procedures.

b. Oil Pump Assembly. See figure 6–23 and reassemble the oil pump assembly in the reverse order of numerical sequence. Assemble oil pump but do not install the assembly until connecting rods (25, fig. 6–19) have been attached to crankshaft (35). Refer to paragraph 6–24*g*.

c. Cylinder Block Assembly. See figure 6–22 and reassemble the cylinder block assembly in the reverse order of numerical sequence. Note the following:

(1) Valve tappets (13) and valve tappet adjusting screws (12) are not installed at this time. Refer to paragraph 6–24*e*.

(2) Compress valve springs (8) to install valve spring seats (9) and valve spring seat locks (10) (fig. 6–25).

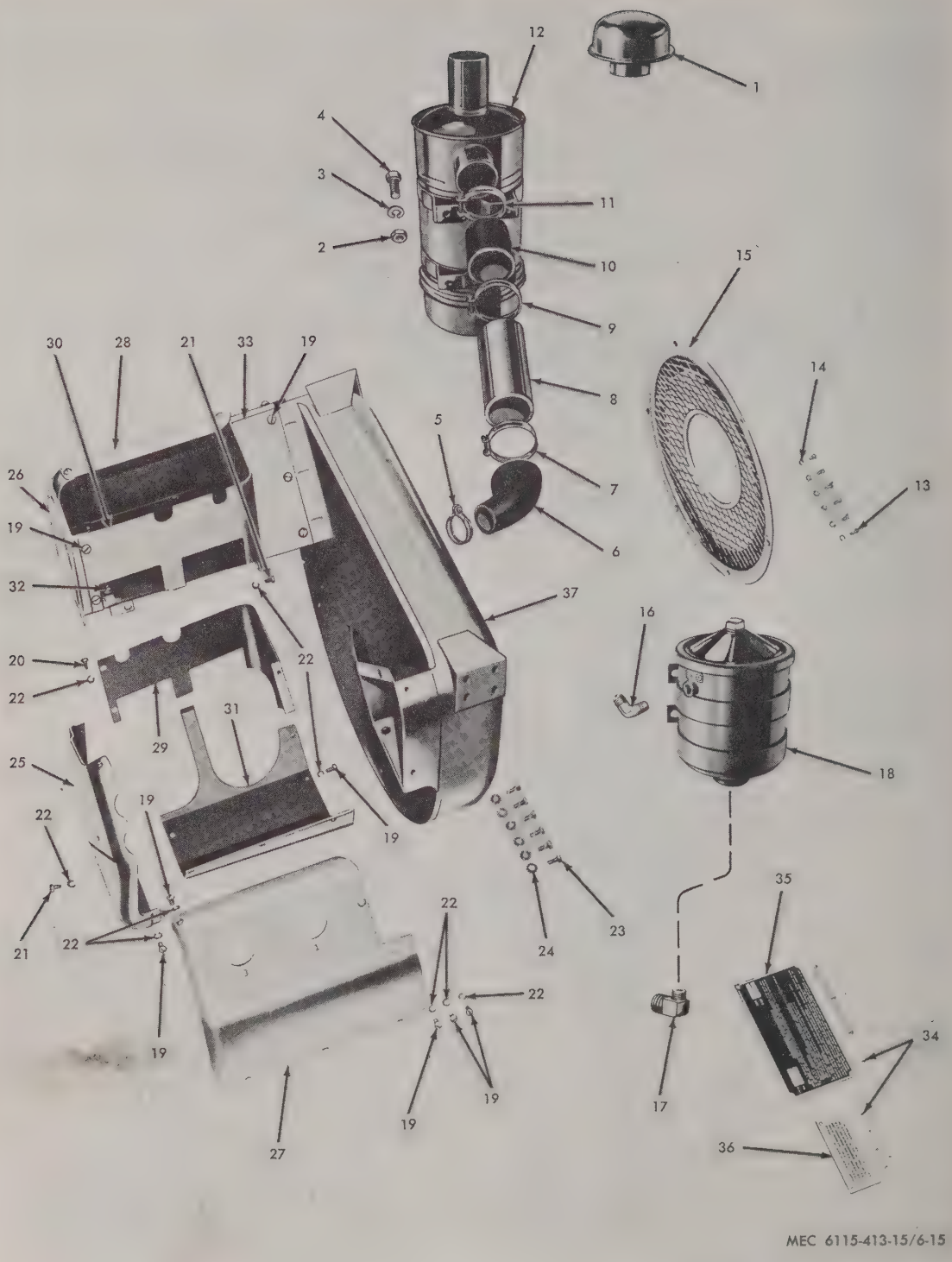


Figure 6–15. Oil filter, air shrouds, and air cleaner group, exploded view

Figure 6–15—Continued

1 Air breather cap
2 Nut, hex, 5/16–18 (4)
3 Washer, lock, 5/16 in. (4)
4 Screw, hex-hd, 5/16–18 x ⅝ in. (4)
5 Hose clamp, 1⅞ in. ID
6 Rubber elbow
7 Hose clamp, 2¼ in. ID
8 Air cleaner tube
9 Hose clamp, 2¼ in. ID
10 Rubber hose
11 Hose clamp, 2¼ in. ID
12 Air cleaner
13 Screw, hex-hd, ¼–20 x ⅜ in. (6)
14 Washer, lock, ¼ in. (6)
15 Flywheel screen
16 Oil filter elbow
17 Oil filter return elbow
18 Oil filter
19 Screw, round-hd, 5/16–18 x ⅜ in. (27)
20 Screw, hex-hd, ¼–20 x ½ in. (4)
21 Screw, round-hd, ¼-20 x ¾ in. (4)
22 Washer, lock, ¼ in. (32)
23 Screw, hex-hd, 5/16 18 x ½ in. (6)
24 Washer, lock, external tooth, 5/16 in. (6)
25 Left-hand side rear shroud cover
26 Right-hand side rear shroud cover
27 Left-hand side cylinder head shroud
28 Right-hand side cylinder head shroud
29 Left-hand side cylinder heat deflector
30 Right-hand side cylinder heat deflector
31 Left-hand side lower cylinder shroud
32 Right-hand side lower cylinder shroud
33 Flywheel shroud side cover
34 Rivet, blind, ⅛ in. dia (8)
35 Instruction plate
36 Identification plate
37 Flywheel air shroud

Note. Install valves (5, fig. 6–22) in the same valve guides (7) from which they were removed.

Caution: **Make certain valve spring seat locks (10) are properly seated before releasing spring tension.**

(3) Cover plates (3), flat washers (2) and screws (1) are not installed until cylinder block assemblies have been secured to crankcase assembly (22, fig. 6–14), and valve tappet adjusting screws (12, fig. 6–22) have been adjusted. Refer to paragraph 6–24*g*.

d. Idler Gear and Oil Filler Mounting Group. See figure 6–21 and reassemble the idler gear and oil filler mounting group in the reverse order of numerical sequence. Note the following:

(1) Secure gear cover gasket (20, fig. 6–16) and spacer to crankcase gasket (23) to crankcase assembly (22, fig. 6–14) with screws (21, fig. 6–16) and lock washers (22).

(2) Position idler gear stud (11, fig. 6–21) and idler gear (12) into crankcase assembly (22, fig. 6–14) with the oil groove in idler gear stud facing upward.

(3) Using a soft metal hammer or mallet, drive idler gear stud into crankcase assembly, maintaining a 0.003 to 0.004-inch clearance between the idler gear and idler gear drive stud.

e. Camshaft and Fuel Pump Mounting Group. See figure 6–20 and reassemble the camshaft and fuel pump mounting group in the reverse order of numerical sequence. Note the following:

(1) Install valve tappets (13, fig. 6–22) with valve tappet adjusting screws (12) into crankcase assembly (22, fig. 6–14) before installing camshaft (25, fig. 6–20) into crankcase assembly. See figure 6–26 when installing camshaft.

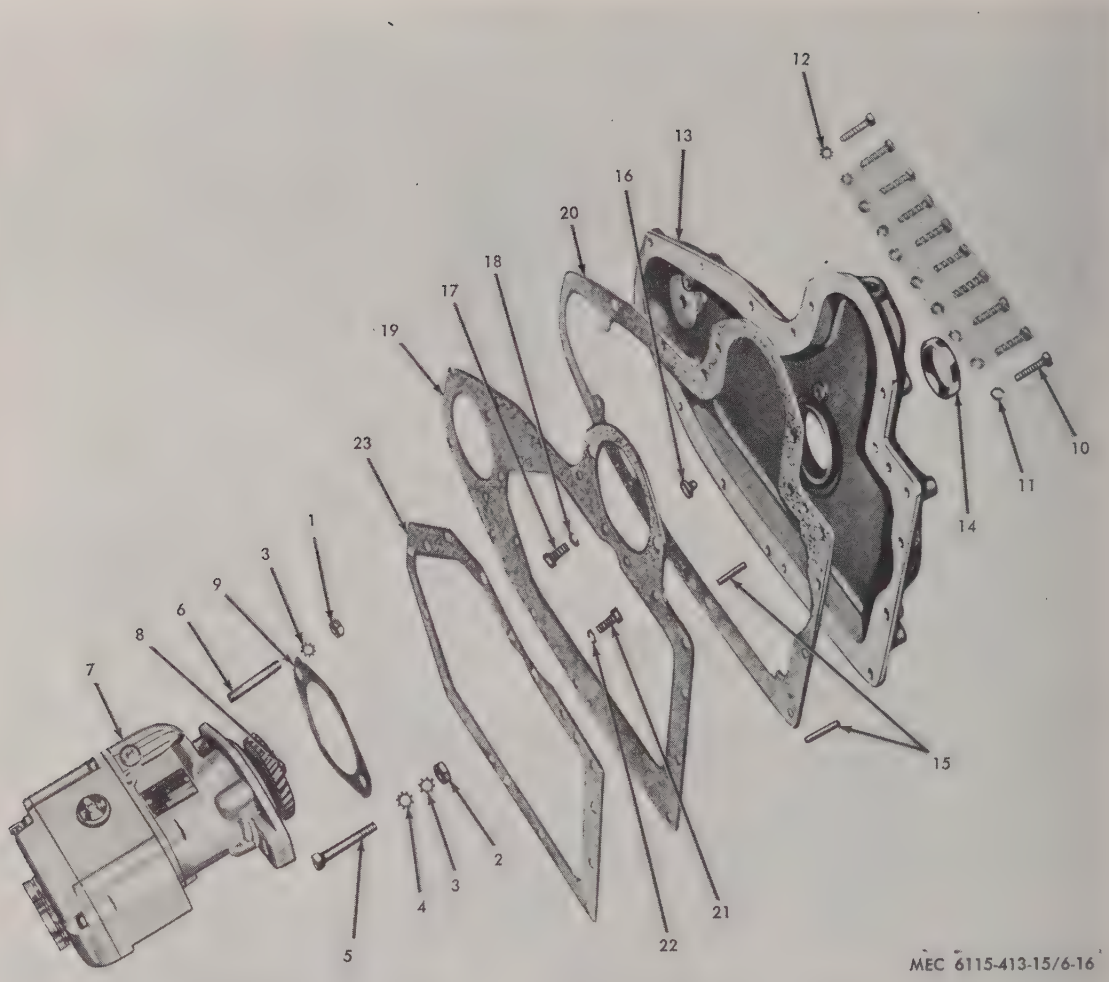
(2) When attaching camshaft gear (22, fig. 6–20) to camshaft (25), note that the mounting holes in the camshaft gear are staggered so the gear can be installed in only the correct position.

(3) Refer to Section V for coverage on fuel pump (7).

f. Crankshaft, Pistons, and Connecting Rod Group. See figure 6–19 and reassemble the crankshaft, pistons, and connecting rod group in the reverse order of numerical sequence. Note the following:

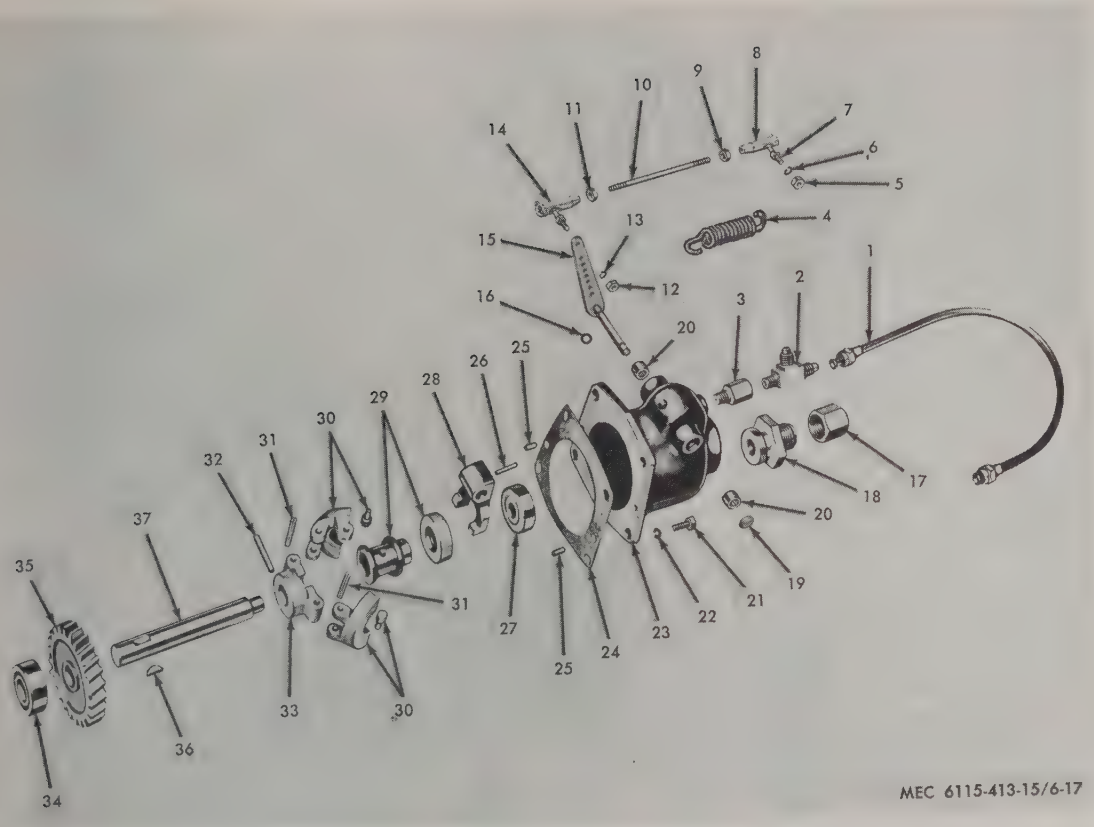
(1) See figure 6–27 when installing crankshaft.

(2) When installing crankshaft gear (27, fig. 6–19) rotate crankshaft gear and crankshaft (35) so that when crankshaft gear is installed, the timing mark on this gear is aligned with timing mark on camshaft gear (22, fig. 6–20) (fig. 6–28).



1 Nut, hex, ⅜-24
2 Nut, hex, ⅜-16
3 Washer, lock, external tooth, ⅜ in. (2)
4 Washer, lock, internal and external tooth, ⅜ in.
5 Screw, hex-hd, ⅜–16 x 2½ in.
6 Stud
7 Magneto
8 Magneto gear
9 Magneto gasket
10 Screw, hex-hd, 5/16–18 x 1¼ in. (10)
11 Washer, lock, 5/16 in. (8 rqr)
12 Washer, lock, external tooth, 5/16 in. (2)
13 Gear cover
14 Oil seal
15 Dowel pin (2)
16 Camshaft thrust plunger button
17 Screw, hex-hd, 5/16–18 x ¾ in. (2)
18 Washer, lock, 5/16 in. (2)
19 Gear cover spacer
20 Gear cover gasket
21 Screw, hex-hd, 5/16–18 x ⅝ in. (5)
22 Washer, lock, 5/16 in. (5)
23 Spacer to crankcase gasket

Figure 6–16. Magneto and gear cover group, exploded view



1 Oil line
2 Tee
3 Restricted oil line fitting
4 Governor spring
5 Nut, hex, No. 10–32
6 Washer, lock, No. 10
7 Spacer
8 Control rod ball joint
9 Nut, hex, No. 10–32
10 Control rod lever
11 Nut, hex, No. 10–32
12 Nut, hex, No. 10–32
13 Washer, lock, No. 10
14 Control rod ball joint
15 Shaft and lever
16 O-ring
17 Adapter cap
18 Tachometer adapter
19 Expansion plug
20 Bearing (2)
21 Screw, hex-hd, 5/16–18 x ⅞ in. (4)
22 Washer, lock, 5/16 in. (4)
23 Governor housing
24 Housing gasket
25 Dowel pin (2)
26 Taper pin
27 Housing bearing
28 Yoke
29 Thrust sleeve and housing assembly
30 Flyweight with thrust pin (2)
31 Roll pin (2)
32 Taper pin
33 Flyweight hub
34 Shaft bearing
35 Gear
36 Woodruff key
37 Drive shaft

Figure 6–17. Governor assembly, exploded view

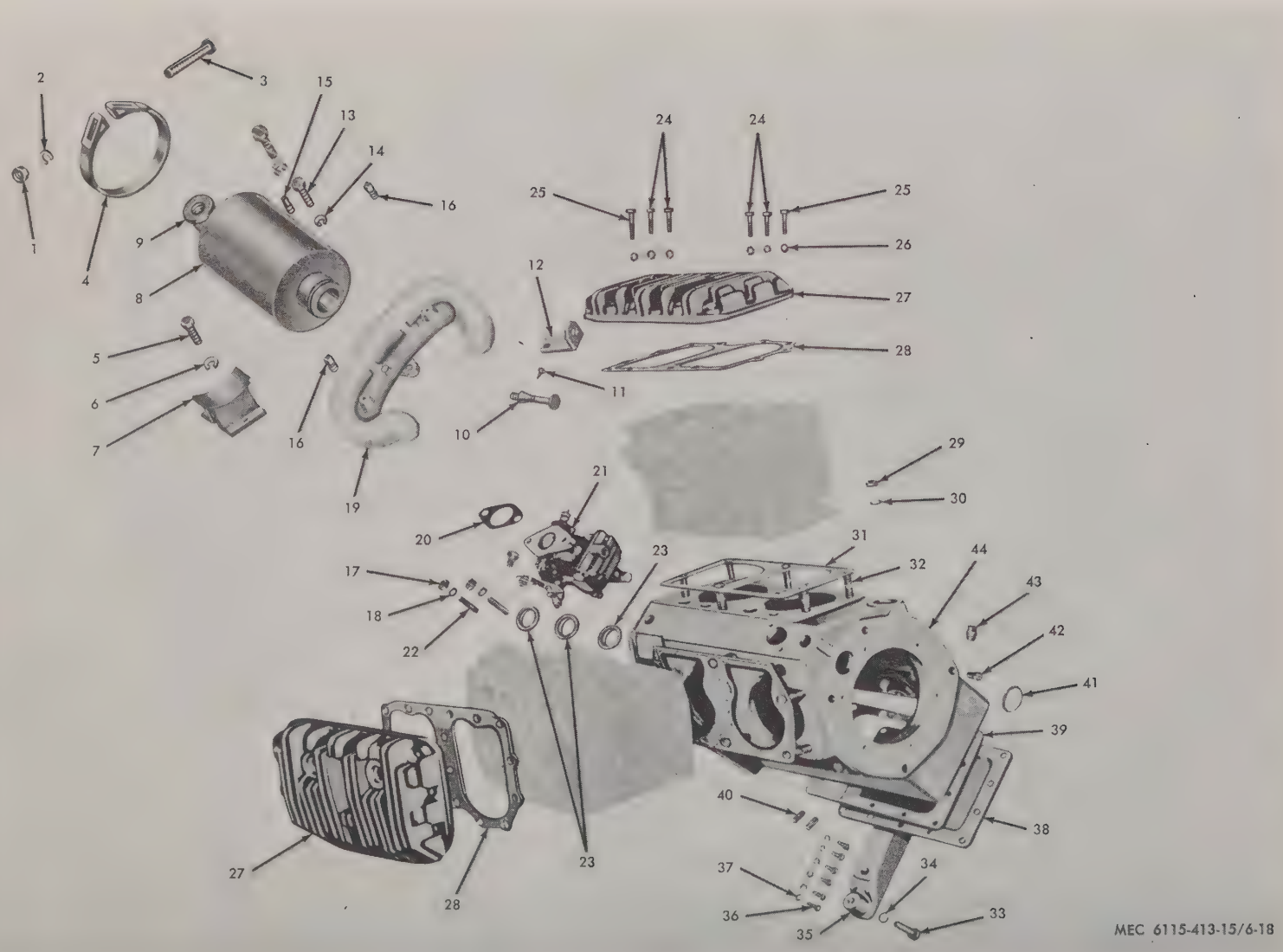


Figure 6–18. Manifold and crankcase group, exploded view

Figure 6–18—Continued

1 Nut, hex, No. 12–24
2 Washer, lock, No. 12
3 Screw, fillister-hd, No. 12–24 x 1¾ in.
4 Muffler strap
5 Screw, hex-hd, ¼–20 x ⅝ in. (2)
6 Washer, lock, ¼ in. (2)
7 Muffler cradle support
8 Muffler
9 Elbow
10 Choke control rod
11 Screw, self-tapping, No. 8 x ½ in. (2)
12 Choke control bracket
13 Screw, hex-hd, 5/16–18 x 1 in. (2)
14 Washer, lock, 5/16 in. (2)
15 Pipe plug, ⅛ in.
16 Pipe plug, ¼ in. (2)
17 Nut, hex, ⅜–24 (4)
18 Washer, flat, ⅜ in. (4)
19 Exhaust manifold
20 Carburetor gasket
21 Carburetor
22 Manifold to cylinder block mounting stud (4)
23 Manifold gasket (3)
24 Screw, hex-hd, 5/16–18 x 1¼ in. (30)
25 Screw, hex-hd, 5/16–18 x 1⅜ in. (4)
26 Washer, flat, 5/16 in. (34)
27 Cylinder head (2)
28 Cylinder head gasket (2)
29 Nut, hex, 7/16–20 (12)
30 Washer, lock, 7/16 in. (12)
31 Cylinder base gasket (2)
32 Cylinder block mounting stud (12)
33 Screw, hex-hd, ½–13 x 1½ in. (4)
34 Washer, lock, ½ in. (4)
35 Engine support (2)
36 Screw, hex-hd, 5/16–18 x ⅝ in. (14)
37 Washer, lock, 5/16 in. (14)
38 Crankcase bottom cover plate
39 Crankcase bottom cover gasket
40 Starter bracket stud (2)
41 Expansion plug
42 Plug, 7/16–14 (4)
43 Magnetic oil drain plug
44 Crankcase assembly

(3) Tighten screws (7, fig. 6–19) to a torque of 20 to 30 foot-pounds.

(4) Check end play of crankshaft (35). If the end play is not 0.002 to 0.004 inch, reselect bearing plate gaskets (10 and 12) and bearing plate shims (11 and 13) as required.

Note. If the removed gasket thickness was duplicated at reassembly, and the same shims were used, reselection of shims should not be required.

(5) Do not install flywheel (5) until gear cover (13, fig. 6–16) has been installed.

(6) Assemble connecting rod (25, fig. 6–19), piston pin bushing (24), piston pin (22), piston pin retaining rings (21) and piston (23) for each clyinder.

Note. If cylinder heads have been reground oversize, use the correct oversize pistons (23).

(7) Assemble piston compression ring (18), piston scraper ring (19), and piston oil ring (20) on each piston (23). See figure 6–29 for method of installing piston rings and see figure 6–30 for correct placement of rings. When installing rings, place the open end of the ring on the piston first; spread ring only far enough to slip over piston and into correct groove. Be careful not to distort ring. Be sure that piston scraper ring (19, fig. 6–19) is installed with scraper side down. Stagger piston ring gaps 90 degrees apart around the piston.

Note. Do not install pistons until cylinder blocks have been assembled to crankcase assembly. (para 6–24*g*.)

g. Manifold and Crankcase Group. See figure 6–18 and reassemble the manifold and crankcase group in the reverse order of numerical sequence. Note the following:

(1) Attach cylinder block assemblies (figure 6–22) to crankcase assembly (44, fig. 6–18). Make sure each cylinder block is installed on the same side of the crankcase as it was before disassembly. Tighten cylinder block nuts (29) to a torque of 40 to 50 foot-pounds.

(2) Lubricate assembled pistons and cylinder walls with oil. Using a suitable ring compressor, install pistons into cylinders. Be sure the arrow on the top of each piston is pointing in the direction of crankshaft rotation.

(3) Attach connecting rods (25, fig. 6–19) to crankshaft (35) with shell bearings (17), connecting rod bolts (16), nuts

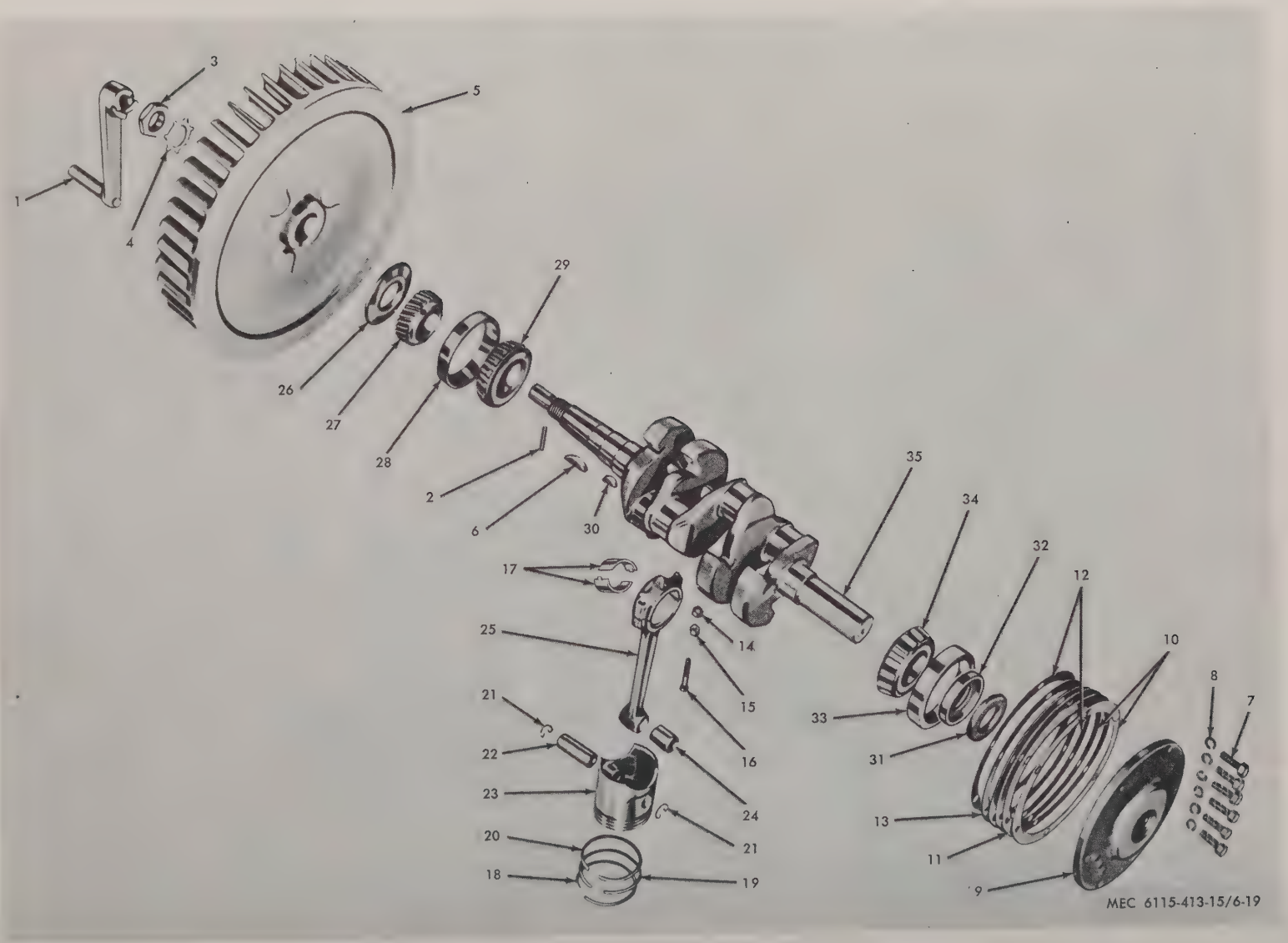


Figure 6–19. Crankshaft, pistons, and connecting rod group, exploded view

Figure 6–19—Continued

1 Starting hand crank
2 Starting crank pin
3 Flywheel mounting nut
4 Tab washer
5 Flywheel
6 Woodruff key
7 Screw, hex-hd, ⅜–16 x 1¼ in. (6)
8 Washer, lock, ⅜ in. (6)
9 Main bearing plate assembly
10 Bearing plate gasket (3)
11 Bearing plate shim (0.006 in. thick)
12 Bearing plate gasket (3)
13 Bearing plate shim (0.013 in. thick)
14 Palnut, 5/16–24 (8)
15 Nut, hex, 5/16–24 (8)
16 Connecting rod bolt, 5/16–24 (8)
17 Shell bearing (4 sets)
18 Piston compression ring (4)
19 Piston scraper ring (4)
20 Piston oil ring (4)
21 Piston pin retaining ring (8)
22 Piston pin (4)
23 Piston (4)
24 Piston pin bushing (4)
25 Connecting rod (4)
26 Oil slinger
27 Crankshaft gear
28 Bearing cup
29 Bearing cone
30 Woodruff key
31 Cork oil seal
32 Oil seal retainer
33 Bearing cup
34 Bearing cone
35 Crankshaft

(15), and palnuts (14). Tighten nuts to a torque of 22 to 24 foot-pounds. Tighten palnuts hand-tight, then tighten an additional ¼ turn with a wrench. Make sure the number stamped on the connecting rod and connecting rod cap is on the same side, as shown in figure 6–31.

(4) Position assembled oil pump (fig. 6–23) into crankcase and secure oil pump with lockscrew (2, fig. 6–23) as shown in figure 6–32. Attach remainder of oil fittings shown in figure 6–23.

(5) Attach oil pump drive gear (4) to drive shaft (18) with Woodruff key (15) and lock nut (3).

(6) With valve tappets (13, fig. 6–22) at their lowest point, set valve tappet adjusting screws (12), for 0.008 inch clearance between inlet valves (5), and for 0.016 inch clearance between exhaust valves (5). See figure 6–33.

(7) Install cover plates (3, fig. 6–22), flat washers (2), and screws (1) to cylinder blocks (14).

(8) When securing crankcase bottom cover plate (38, fig. 6–18), tighten screws (36) to a torque of 6 to 9 foot-pounds.

(9) When installing cylinder heads (27), tighten screws (24 and 25) to a torque of 22 to 24 foot-pounds.

Note. Apply a mixture of graphite and oil to screws before installing.

(10) Do not install exhaust manifold (19), carburetor (21), or muffler (8) until governor assembly (figure 6–17) has been installed. Refer to paragraph 6–24*h*.

h. Governor Assembly. See figure 6–17 and reassemble the governor assembly in the reverse order of numerical sequence. Note the following:

(1) Engage governor spring (4, fig. 6–17) into the twelfth (top) spring hole of shaft and lever (15).

(2) Completely assemble governor assembly but do not install it until gear cover (13, fig. 6–16) is secured to crankcase assembly (44, fig. 6–18).

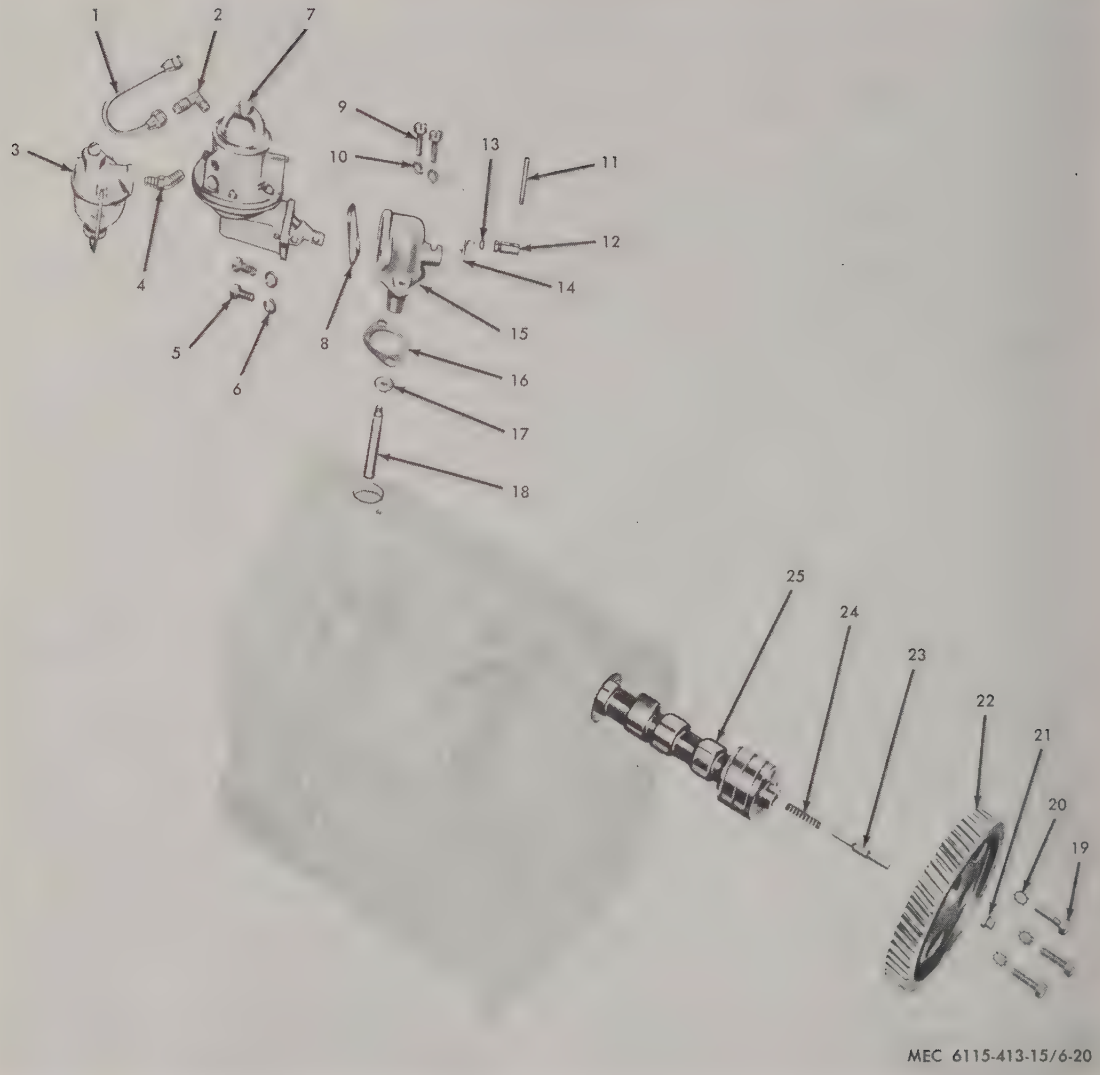
i. Magneto and Gear Cover Group. See figure 6–16 and reassemble the magneto and gear cover group in the reverse order of numerical sequence. Note the following:

(1) Refer to paragraph 6–46 for correct method of assembling magneto gear (8) to magneto (7), and for installation of the magneto on the engine.

(2) When installing gear cover (13) tighten screws (10) to a torque of 14 to 18 foot-pounds.

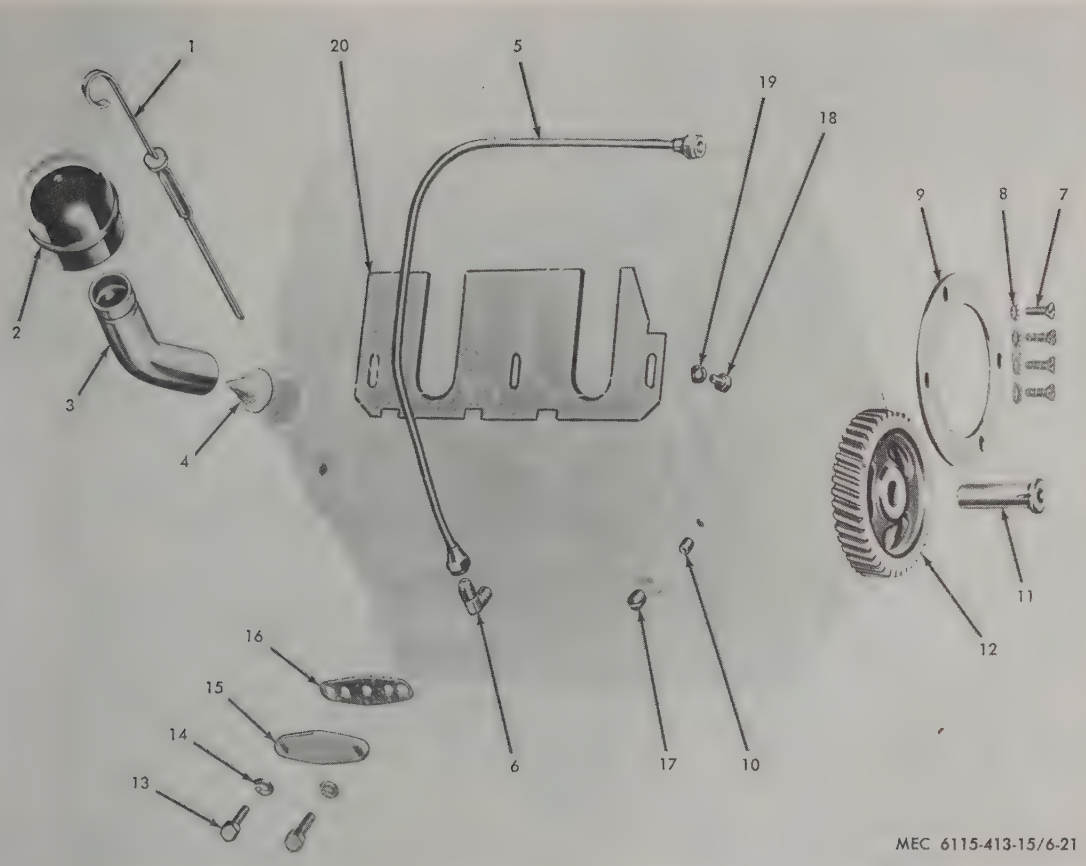
(3) After gear cover (13) is secured to the crankcase, install governor assembly and connect the linkage.

j. Oil Filter, Air Shrouds, and Air Cleaner



1 Fuel line
2 Fuel line elbow
3 Fuel strainer
4 Fuel strainer elbow
5 Screw, hex-hd, 5/16–18 x ¾ in. (2)
6 Washer, lock, 5/16 in. (2)
7 Fuel pump
8 Fuel pump gasket
9 Screw, hex-hd, ¼–20 x ¾ in. (2)
10 Washer, lock, ¼ in. (2)
11 Handle
12 Shaft
13 O-ring
14 Spring
15 Fuel pump adapter
16 Fuel pump adapter gasket
17 Cap
18 Plunger
19 Screw, hex-hd, 5/16–18 x 1 in. (3)
20 Washer, lock, external tooth, 5/16 in. (3)
21 Camshaft thrust plunger button
22 Camshaft gear
23 Camshaft thrust plunger
24 Spring
25 Camshaft

Figure 6–20. Camshaft and fuel pump mounting group, exploded view



1 Oil saber
2 Oil filler and breather cap
3 Oil filler tube
4 Oil filler screen
5 Case to governor oil line
6 Oil line elbow
7 Screw, flat-hd, 5/16–18 x ¾ in. (4)
8 Washer, lock, external tooth, 5/16 in. (4)
9 Bearing retainer plate
10 Idler gear stud setscrew
11 Idler gear stud
12 Idler gear
13 Screw, hex-hd, 5/16–18 x 1 in. (2)
14 Washer, lock, 5/16 in. (2)
15 Oil filter pad cover plate
16 Oil filter pad cover gasket
17 Pipe plug
18 Screw, hex-hd, ¼–20 x ½ in. (6)
19 Washer, lock, ¼ in. (6)
20 Crankcase splash plate (2)

Figure 6–21. Idler gear and oil filler mounting group, exploded view

Group. See figure 6–15 and reassemble the oil filter, air shrouds and air cleaner group. After these parts are installed, proceed as follows:

(1) Install carburetor (21, fig. 6–18) and connect all linkages.

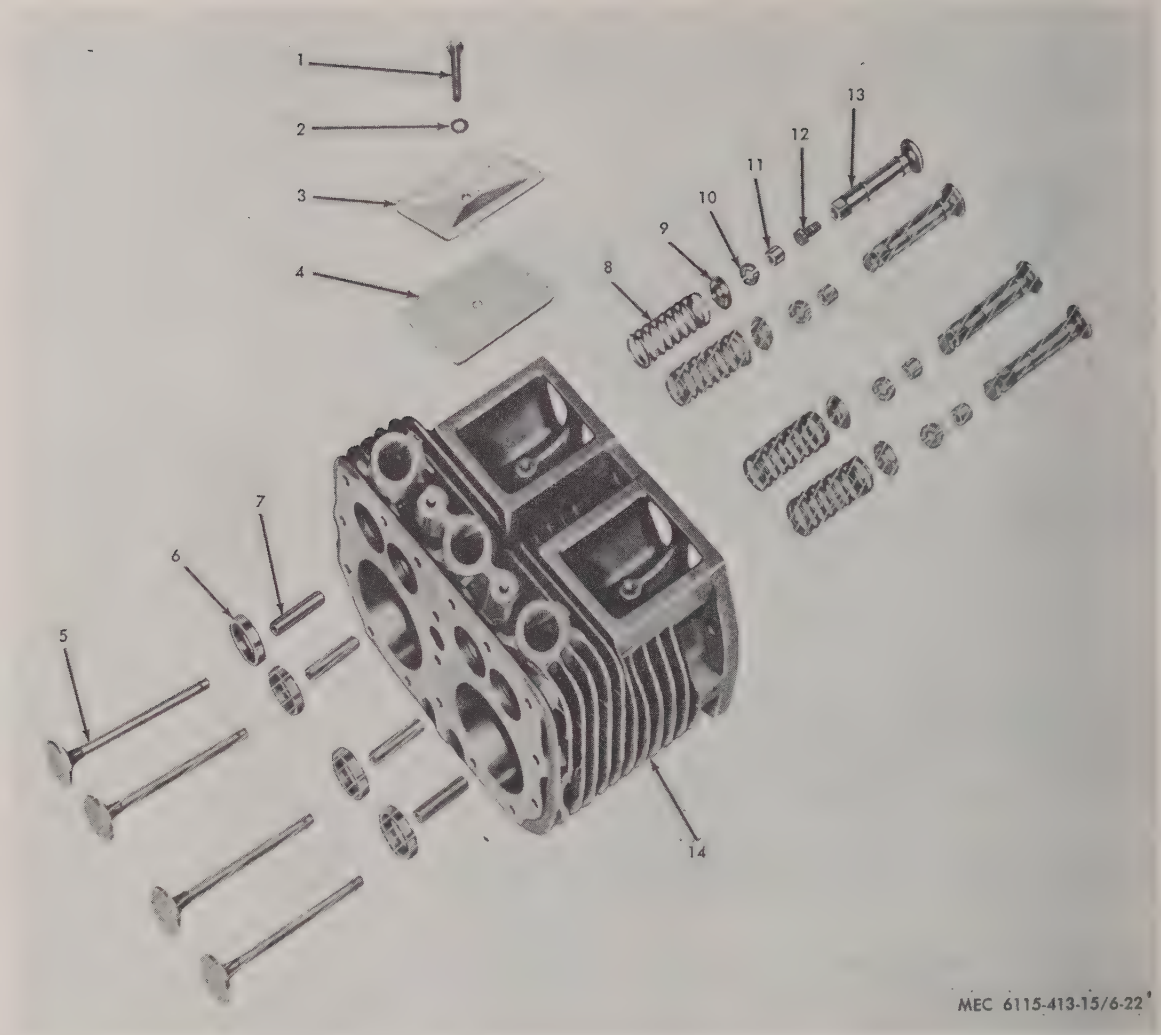
(2) Install exhaust manifold (19) and tighten nuts (17) to a torque of 23 foot-pounds. Secure muffler (8) to exhaust manifold.

6–25. Running In and Adjusting Assembled Engine

a. General. Perform the following procedures before any load is applied to the engine.

b. Refer to paragraph 2–5*c, d,* and *e* for lubrication and fueling instructions.

c. Move shaft and lever (15, fig. 6–17) until carburetor throttle is wide open. There must be 1/16 inch clearance between throttle and



1 Screw, hex-hd, 5/16–18 x 1¾ in. (4)
2 Washer, flat, 5/16 in. (8)
3 Cover plate (4)
4 Cover plate gasket (4)
5 Inlet and exhaust valve (8)
6 Valve seat insert (8)
7 Valve guide (8)
8 Valve spring (8)
9 Valve spring seat (8)
10 Valve spring seat lock (8)
11 Rotator cap (8)
12 Valve tappet adjusting screw (8)
13 Valve tappet (8)
14 Cylinder block (2)

Figure 6–22. Cylinder block assembly, exploded view

stop lever (9, fig. 6–34) and pin of throttle body (16). If this clearance is incorrect adjust spacing between control rod ball joints (8 and 14, fig. 6–17) as required to set clearance at 1/16 inch.

d. Start engine and pull throttle control handle half-way out for engine speed of 1200 to 1400 rpm, without load. Lock the handle by turning ½ turn clockwise. Allow engine to run at this speed for about one-half hour.

e. Unlock throttle control handle by rotating ½ turn counterclockwise, and pull the handle all the way out to increase the engine speed to 2925 to 2950 rpm, and allow the engine to run

for approximately four hours.

f. Unlock the throttle control handle by rotating ½ turn counterclockwise and push the handle half-way in to allow the engine to idle for three minutes.

g. Push throttle control handle all the way in and hold MAGNETO switch in the STOP position until the engine stops.

h. Visually inspect engine components for signs of damage and unsatisfactory operation.

Section IV. CARBURETOR

6–26. General

This section contains complete repair instructions for the carburetor. The carburetor supplies the proper fuel and air mixture necessary for combustion.

6–27. Removal

Remove the carburetor as described in paragraph 3–37.

6–28. Disassembly

See figure 6–34 and disassemble the carburetor in the numerical sequence indicated. Discard all removed parts supplied in carburetor repair kit.

6–29. Cleaning

a. To clean carburetor parts, use an approved cleaning solvent.

b. Blow out channels in throttle body (16, fig. 6–34) and fuel bowl (50).

6–30. Inspection and Repair

a. Inspect float (18, fig. 6–34) for breaks or punctures. Replace if damaged.

b. Inspect throttle and stop lever (9) for signs of excessive wear around mating areas of throttle shaft seals (12). Replace if damaged.

c. Inspect idle needle spring (5) for signs of distortion. Replace if damaged.

d. Inspect choke lever return spring (29) for signs of distortion. Replace if damaged.

6–31. Reassembly

Reassembly is the reverse of numerical sequence as illustrated on figure 6–34. Note the following:

a. Replace all parts supplied in repair kit.

b. When installing float (18, fig. 6–34), use care not to break or puncture the float.

c. Use care when installing throttle shaft seals (12), so as not to damage their sealing properties.

d. Do not tighten idle adjusting needle (4).

6–32. Installation

a. Install the carburetor as described in paragraph 3–38.

b. Adjust carburetor as described in paragraph 3–36.

Section V. FUEL PUMP

6–33. General

This section contains complete repair instructions for the fuel pump.

6–34. Removal

Remove the fuel pump as described in paragraph 3–41.

6–35. Disassembly

See figure 6–35 and disassemble the fuel pump in the numerical sequence indicated. Note the following:

a. Using a file, mark mating ends of fuel head (7, fig. 6–35) and mounting bracket (22).

b. To remove diaphragm (14), disengage diaphragm link from linkage (21).

c. Discard all removed parts supplied in fuel pump repair kit.

6–36. Cleaning

To clean fuel pump parts, use an approved cleaning solvent.

6–37. Inspection and Repair

a. Inspect fuel head (7, fig. 6–35) for damage. Replace if damaged.

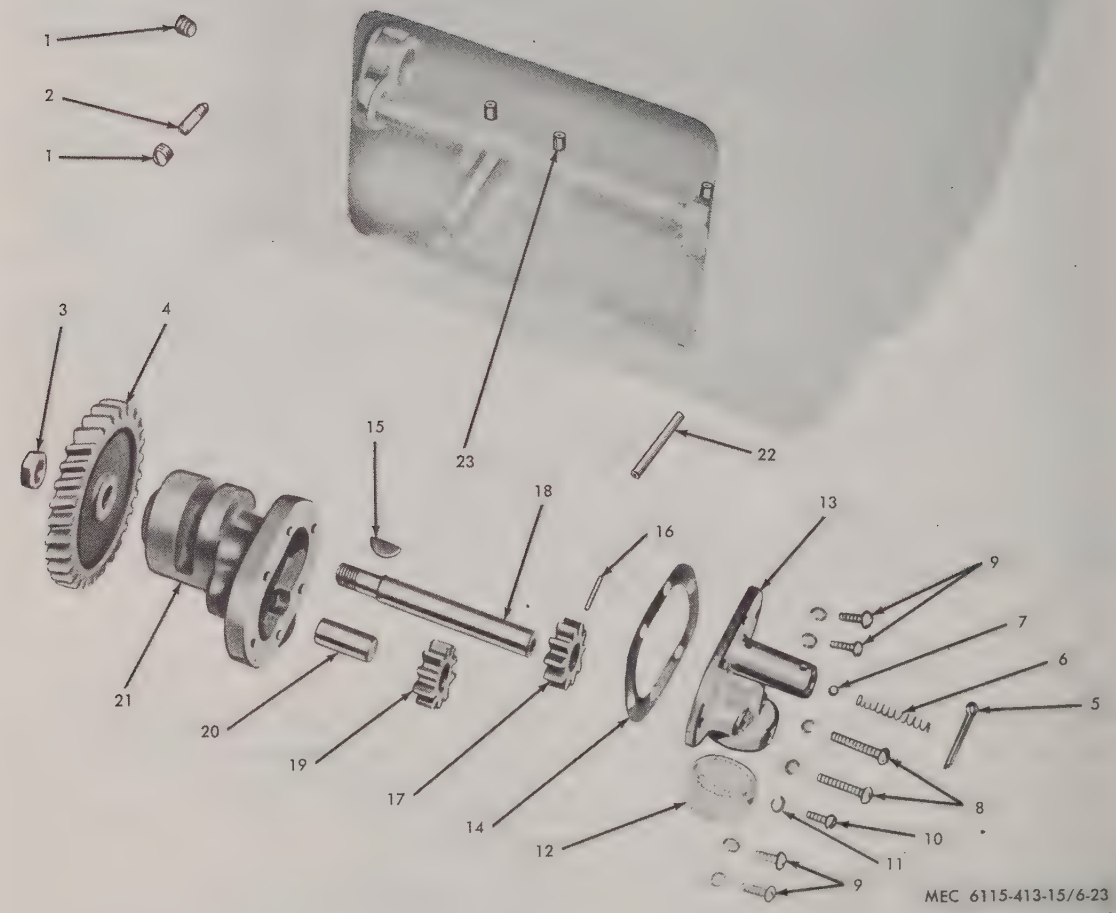


Figure 6–23. Oil pump assembly, exploded view

Figure 6–23—Continued

1 Pipe plug, ⅛ in. (8)
2 Lockscrew
3 Nut, lock, 7/16–20
4 Oil pump drive gear
5 Cotter pin
6 Relief valve spring
7 Ball
8 Screw, round-hd, No. 10–32 x 1¼ in. (2)
9 Screw, round-hd, No. 10–32 x ½ in. (4)
10 Screw, round-hd, No. 10–32 x ⅜ in.
11 Washer, lock, No. 10 (7)
12 Screen
13 Cover assembly
14 Cover gasket
15 Woodruff key
16 Pin, ⅛ dia x ¾ in.
17 Driver gear
18 Drive shaft
19 Driven gear
20 Stub shaft
21 Body
22 Oil filter outlet pipe
23 Oil spray nozzle (4)

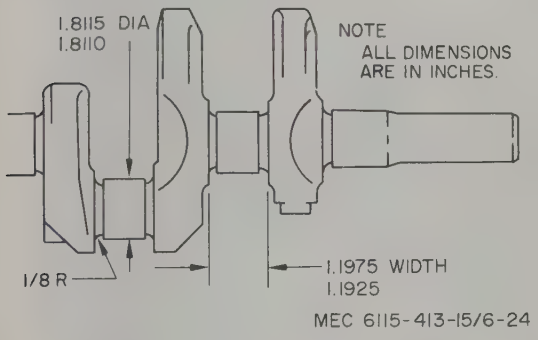


Figure 6–24. Crankshaft inspection

b. Inspect mounting bracket (22) for damage. Replace if damaged.

6–38. Reassembly

Reassembly is the reverse of numerical sequence illustrated on figure 6–35. Note the following:

a. Replace all parts in repair kit.

b. When installing diaphragm (14, fig. 6–35) be sure that diaphragm link is engaged with linkage (21).

c. When assembling fuel head (7) to mounting bracket (22), operate rocker arm (20) until diaphragm (14) is pulled down. Then tighten fuel head mounting screws (6).

Note. Aline the marks on fuel head and mounting bracket made at disassembly.

6–39. Installation

Install the fuel pump as described in paragraph 3–42.

Section VI. MAGNETO

6–40. General

This section contains complete repair instructions for the magneto. The magneto supplies the high voltage necessary for combustion.

6–41. Removal

Remove the magneto as described in paragraph 3–23*c*.

6–42. Disassembly

See figure 6–36 and disassemble the magneto in the numerical sequence indicated on figure 6–36. Discard all removed parts supplied in the repair kit.

6–43. Cleaning

Clean magneto parts using an approved cleaning solvent. Do not clean cam wick (35, fig. 6–36).

6–44. Inspection and Repair

a. Inspect cam wick (35, fig. 6–36) for evidence of dirt and grease. Replace cam wick if it is very dirty or completely saturated with grease.

b. Check that coil (70) is not shorted or open. Check that insulation is not damaged. Replace coil if necessary.

c. Check teeth on rotor gear (42) and shaft and gear (46) for damage or wear. Replace if necessary.

6–45. Reassembly

Reassembly is the reverse of numerical se-

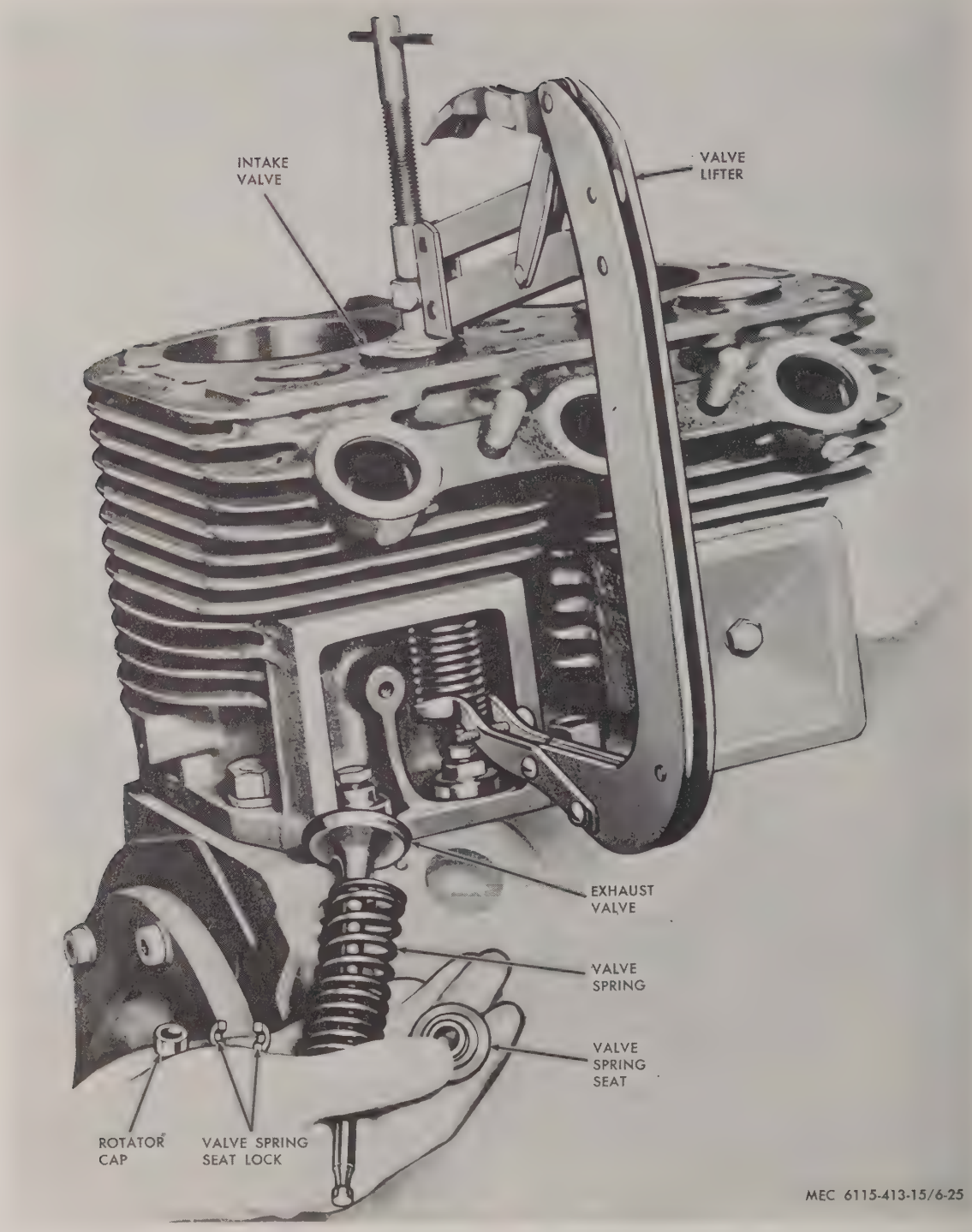


Figure 6–25. Installation of valves

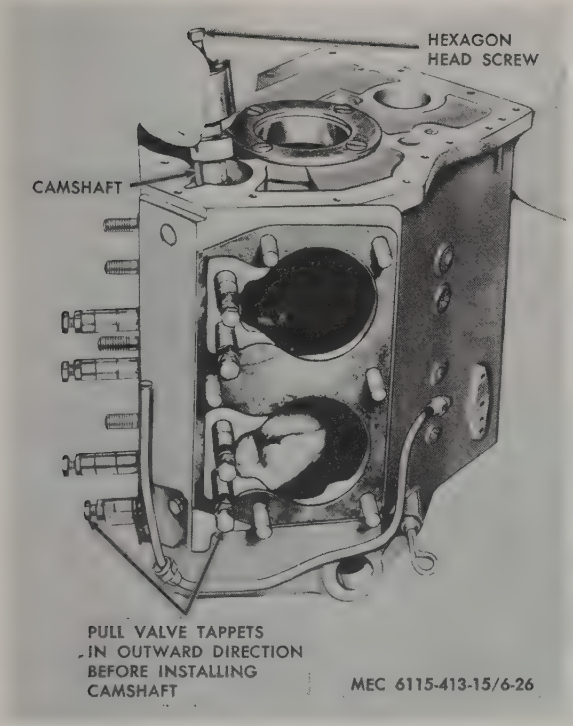


Figure 6–26. Installation of camshaft

quence illustrated on figure 6–36. Note the following:

a. Lubricate cam portion of rotor gear (42, fig. 6–36) with a light coating of FMCO10 magneto grease or equivalent before installing.

b. Mate gear of shaft and gear (46) to rotor gear (42) when flat sides of shaft and gear and rotor gear are adjacent.

c. Install new breaker point set (40). Adjust breaker point gap as described in paragraph 3–44.

6–46. Installation

a. Attach magneto gear (8, fig. 6–16) to magneto as shown in figure 6–37.

b. Remove flywheel screen (15, fig. 6–15).

c. Using the starting hand crank, crank engine until the reference vane on the flywheel is alined with centerline mark on shroud (fig. 6–38).

d. Position magneto with magneto gear indexed as shown in figure 6–38.

e. Secure magneto to gear cover with a screw, two external tooth lock washers, and a nut for the lower bracket mounting hole; and with a nut and stud on the upper mounting hole (fig. 3–8).

f. Connect the ground strap and magneto lead (fig. 3–7).

g. Connect the shielded ignition cables to the corresponding cylinder numbered end caps.

h. Using chalk or paint, mark the edge of the flywheel reference vane.

i. Connect a timing light to the No. 1 terminal of the magneto (fig. 6–38).

j. Using starting hand crank, slowly turn crankshaft. Timing light must flash when marked vane is alined with centerline of No. 1 and No. 3 cylinders (fig. 6–38).

k. Start engine. Timing light must flash when flywheel reference vane is 23 degrees before centerline of No. 1 and No. 3 cylinders.

Section VII. CONTROL BOX ASSEMBLY

6–47. General

This section contains repair instructions for components of the control box assembly which are not replaceable at organizational maintenance level.

6–48. Removal

If it is necessary to remove the entire control box assembly, disconnect all leads and remove screws (73, fig. 6–39), nuts (74), and washers (75 through 77) to free control box subassembly (78) from the generator set chassis.

6–49. Disassembly

See figure 6–39 and disassemble control box assembly components. Do not disassemble any further than necessary to replace damaged components. Note that hardware shown in phantom is supplied with the associated assemblies.

6–50. Cleaning

Use an approved solvent to moisten a clean, lint-free cloth, and wipe the interior surfaces of the control box free from dust and dirt.

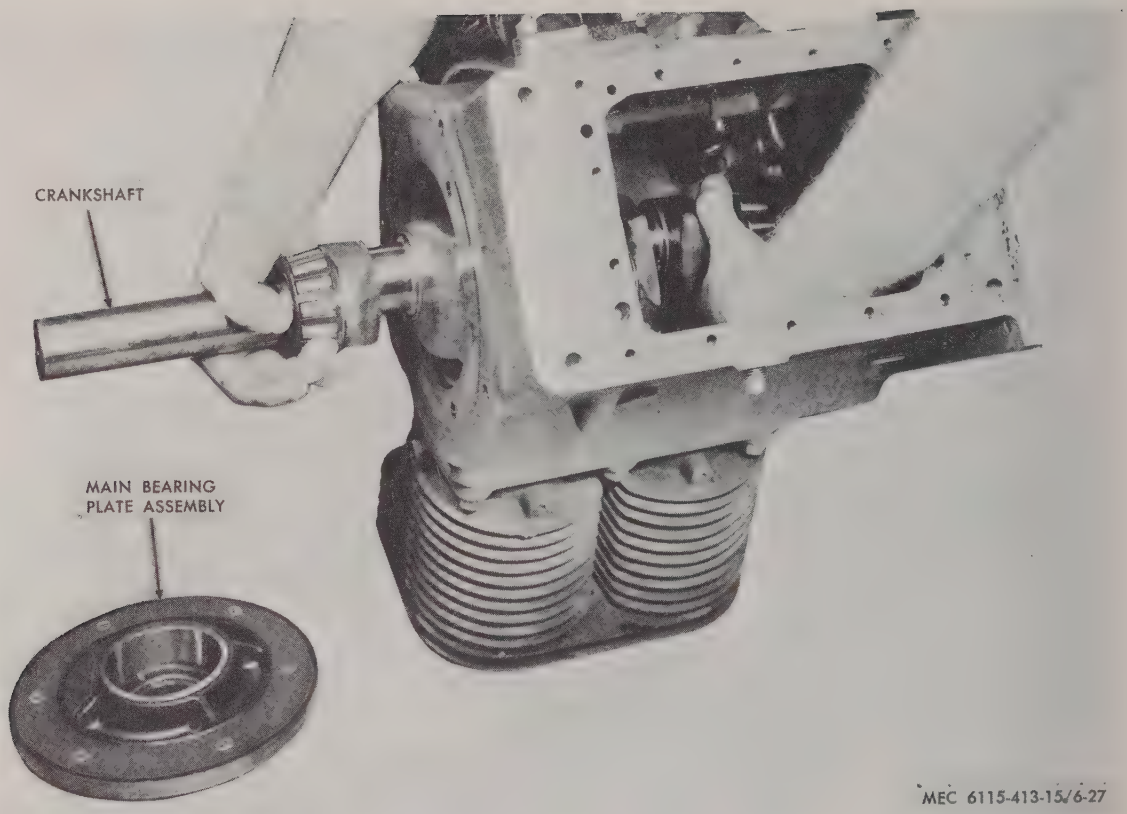


Figure 6–27. Installation of crankshaft

6–51. Inspection and Repair

a. Inspect all wiring for worn, frayed, burned, and otherwise damaged insulation. Replace any damaged wiring.

b. Inspect terminal lugs of all lead assemblies for corrosion, cracks, and other damage. Replace if damaged.

c. Inspect all other parts for visible damage. Replace any damaged parts.

6–52. Testing

a. Using an ohmmeter, check reverse current cutout relay K1 (26, fig. 6–39) for proper operation as follows:

(1) Check the resistance between the APP terminal and the case (ground). The resistance should measure approximately 90 ohms.

(2) Check the resistance between the APP and SW terminals. The resistance should measure approximately 330 ohms.

(3) Check the resistance between the SW terminal and the case (ground). The resistance should measure approximately 220 ohms.

(4) Check the resistance between the BAT and IND terminals. The resistance should measure approximately 6 ohms.

(5) Replace reverse current cutout relay K1 if it does not pass the tests.

b. Test relay K2 (33) for proper operation as follows:

(1) Connect a variable 28-volt dc supply to terminals X1 and X2, and an ohmmeter across terminals A1 and A2.

(2) With no voltage applied, the ohmmeter should indicate an open circuit.

(3) Slowly increase the applied voltage

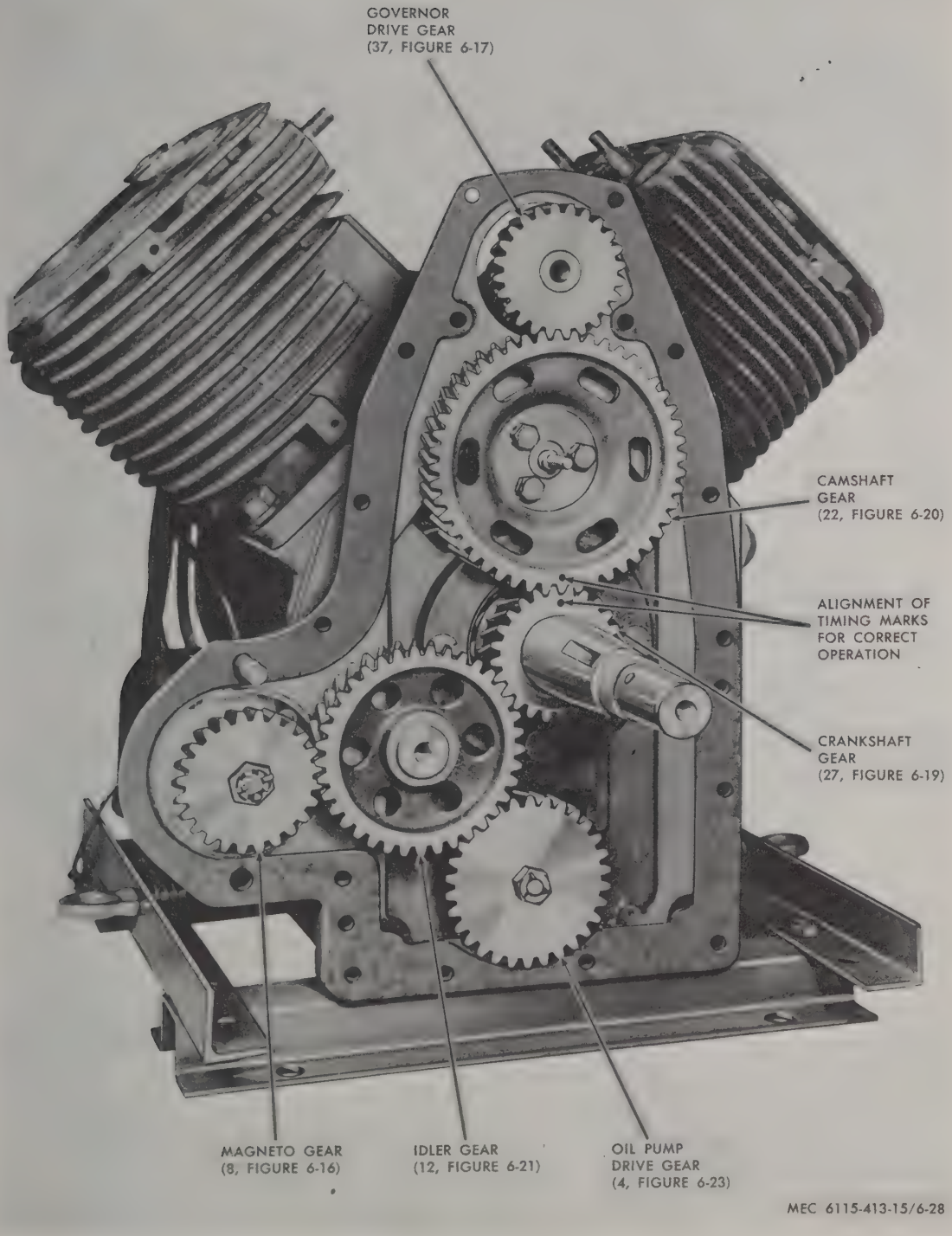


Figure 6–28. Alignment of gears for proper timing of engine

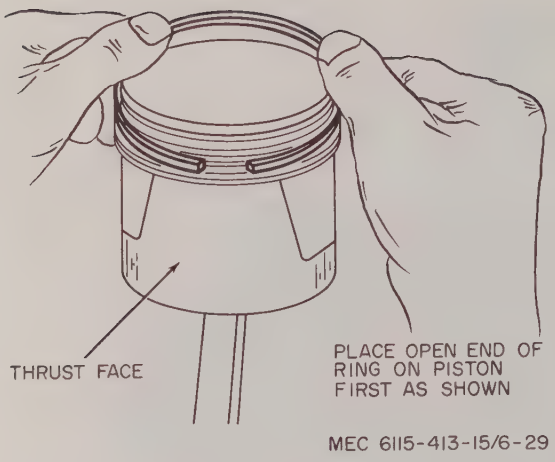


Figure 6–29. Installation of piston rings

until the relay actuates (continuity indicated). The relay should actuate when the applied voltage reaches 18 volts.

(4) Slowly reduce the applied voltage until the relay drops out (open circuit indicated). The relay should drop out when the applied voltage is decreased to between 1.5 and 7 volts.

(5) Replace relay K2 if it does not pass the tests.

6–53. Reassembly

Reassembly is the reverse of numerical sequence illustrated on figure 6–39. Note that the lead numbers given in the legend for figure 6–39 are for reference during reassembly. See figure 1–5, sheet 1 for electrical connections of each lead.

6–54. Installation

Secure the control box assembly to the generator set chassis with screws (73, figure 6–39), nuts (74) and washers (75 through 77). Check that all wiring is in accordance with figure 1–5.

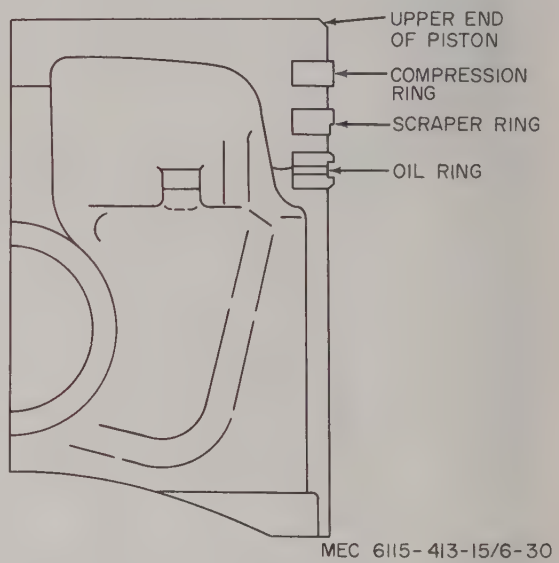


Figure 6–30. Positioning of piston rings

Section VIII. FRAME AND CHASSIS

6–55. General

This section contains repair instructions for the generator set frame and chassis.

6–56. Disassembly

See figure 6–40 and disassemble the frame and chassis only to the extent required to replace damaged parts.

6–57. Cleaning

Use an approved solvent to clean grease, oil, and dirt from all surfaces. Wash roller bearings (70, fig. 6–40) in solvent to completely remove all grease.

Caution: **Make sure bearings are repacked with grease before assembly.**

6–58. Inspection and Repair

a. Check roller bearings (70, fig. 6–40) by rotating them by hand. Replace roller bearings if they do not turn freely or have rough spots which can be felt during rotation.

b. Inspect all frame and structural parts for cracks, distortion and other defects. Repair or replace all damaged parts.

c. Inspect parts for corrosion caused by battery acid. Remove all corrosion by wire brushing.

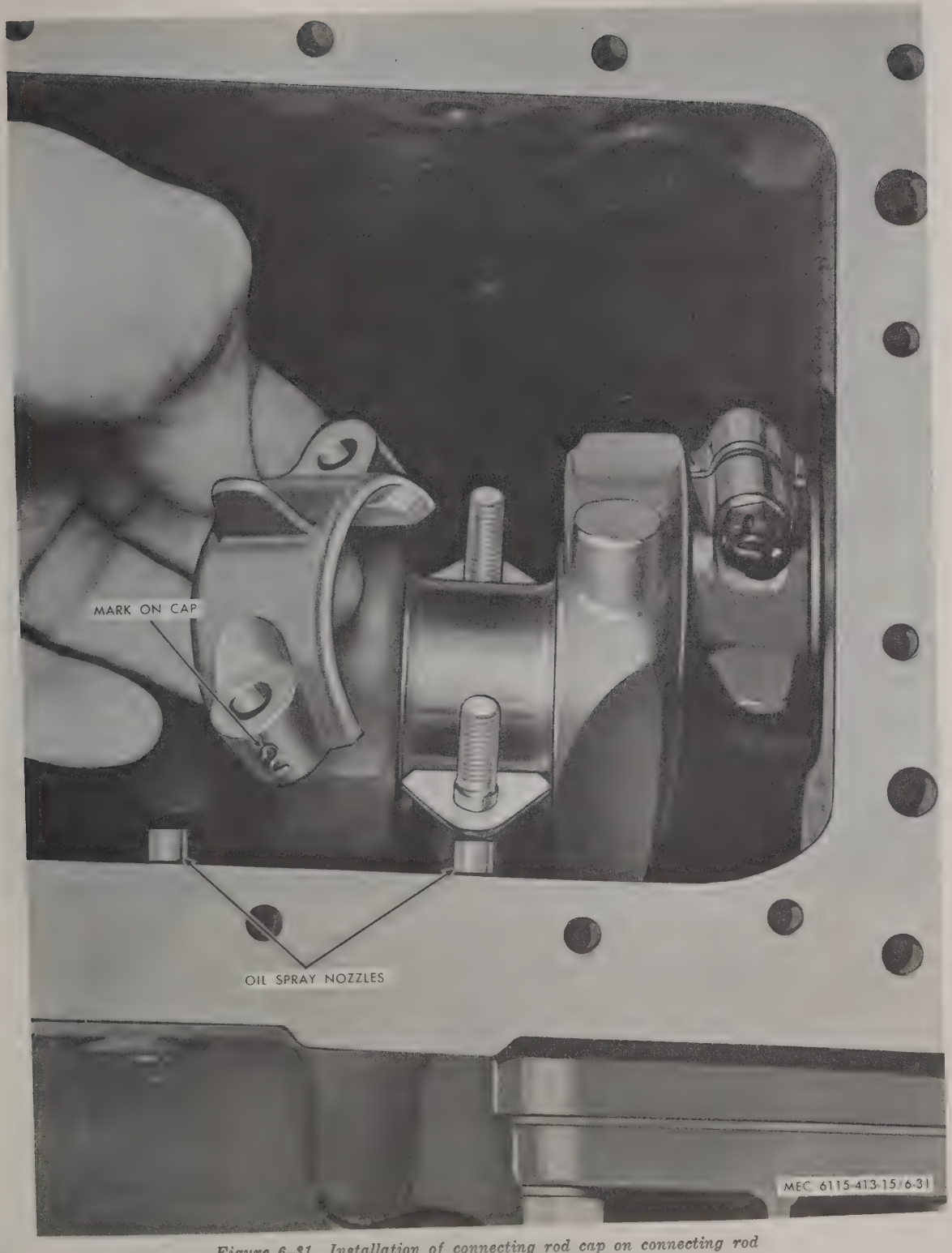


Figure 6–31. Installation of connecting rod cap on connecting rod

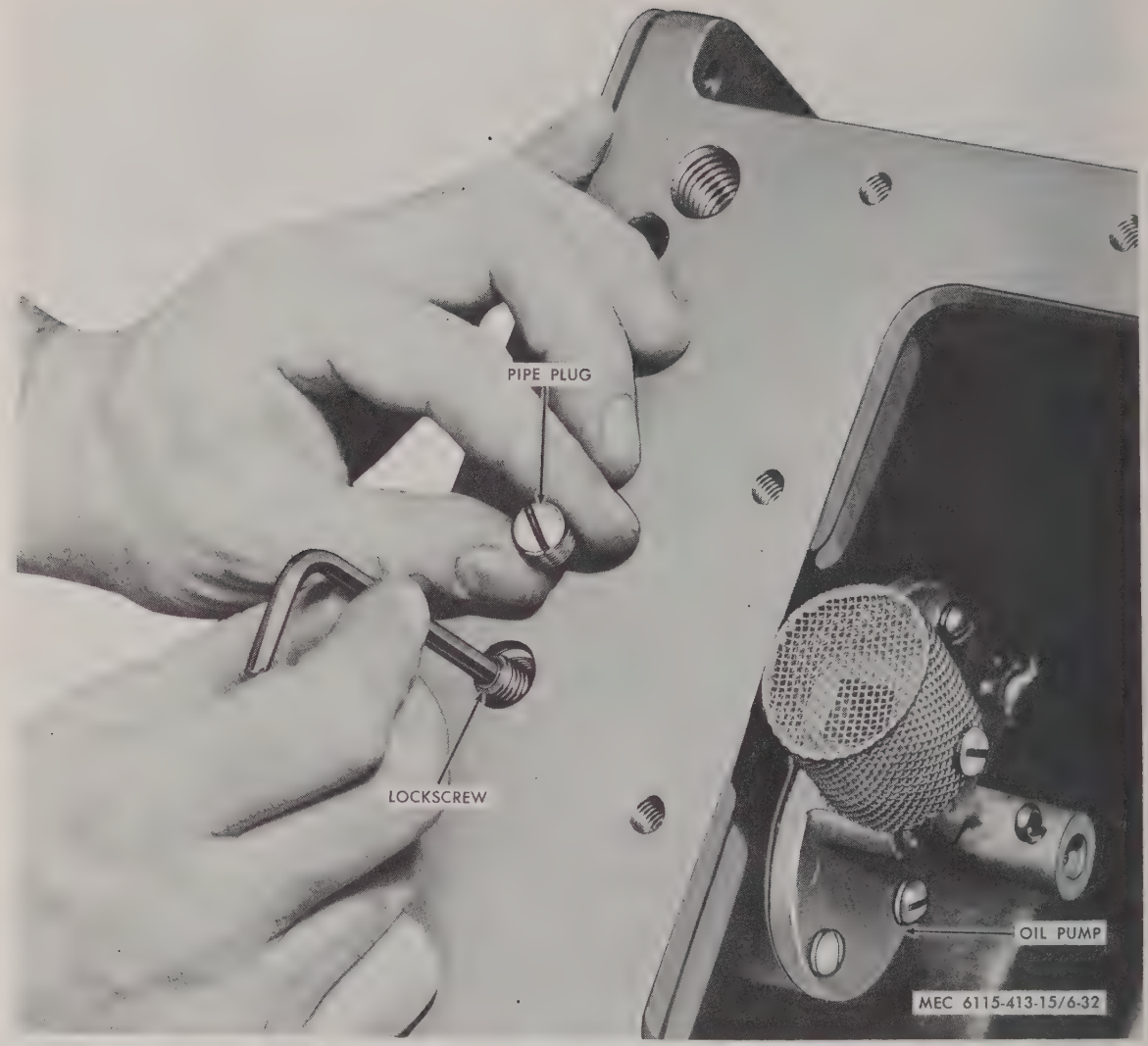


Figure 6–32. Installation of oil pump

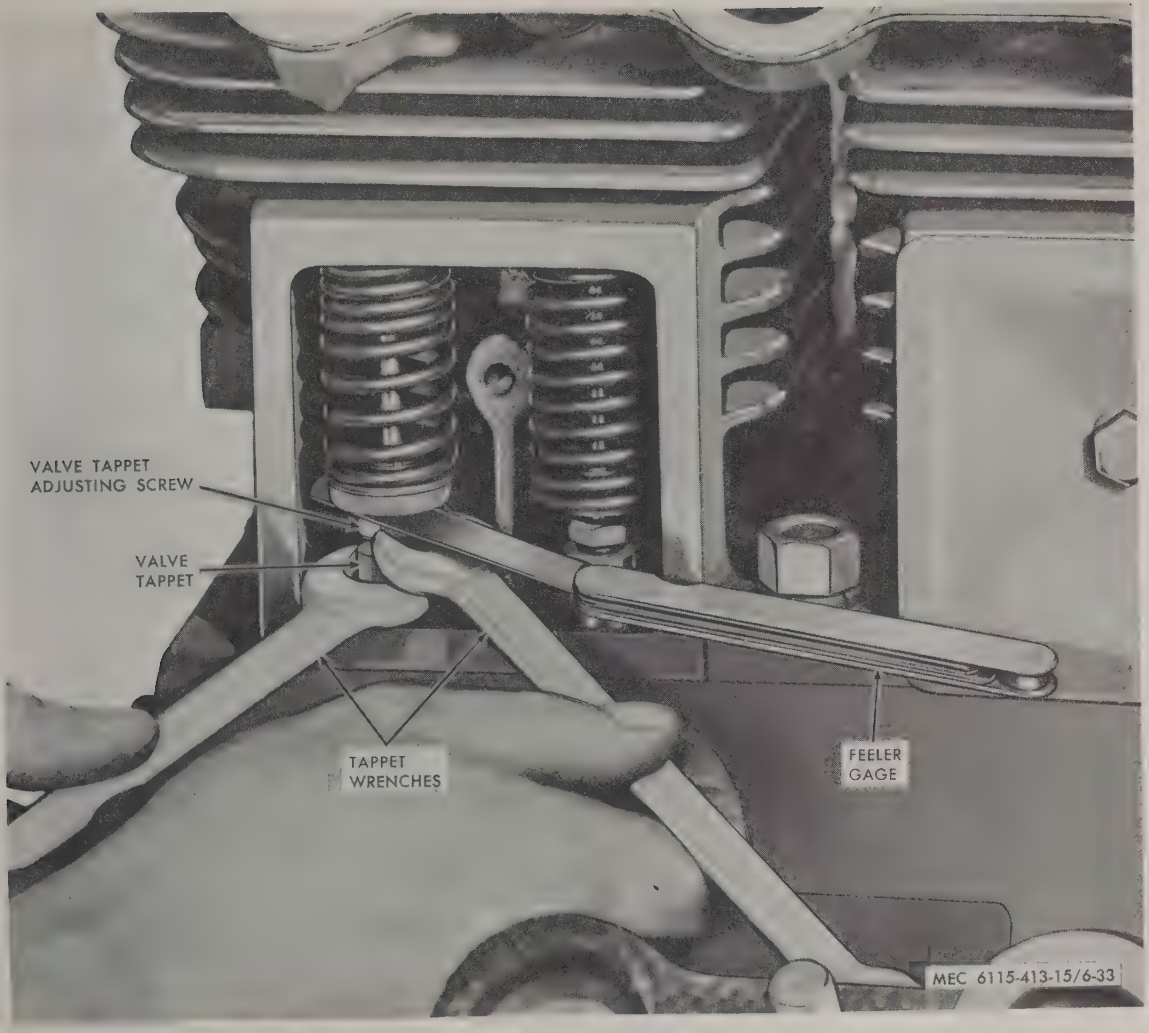


Figure 6–33. Adjustment of valve tappets

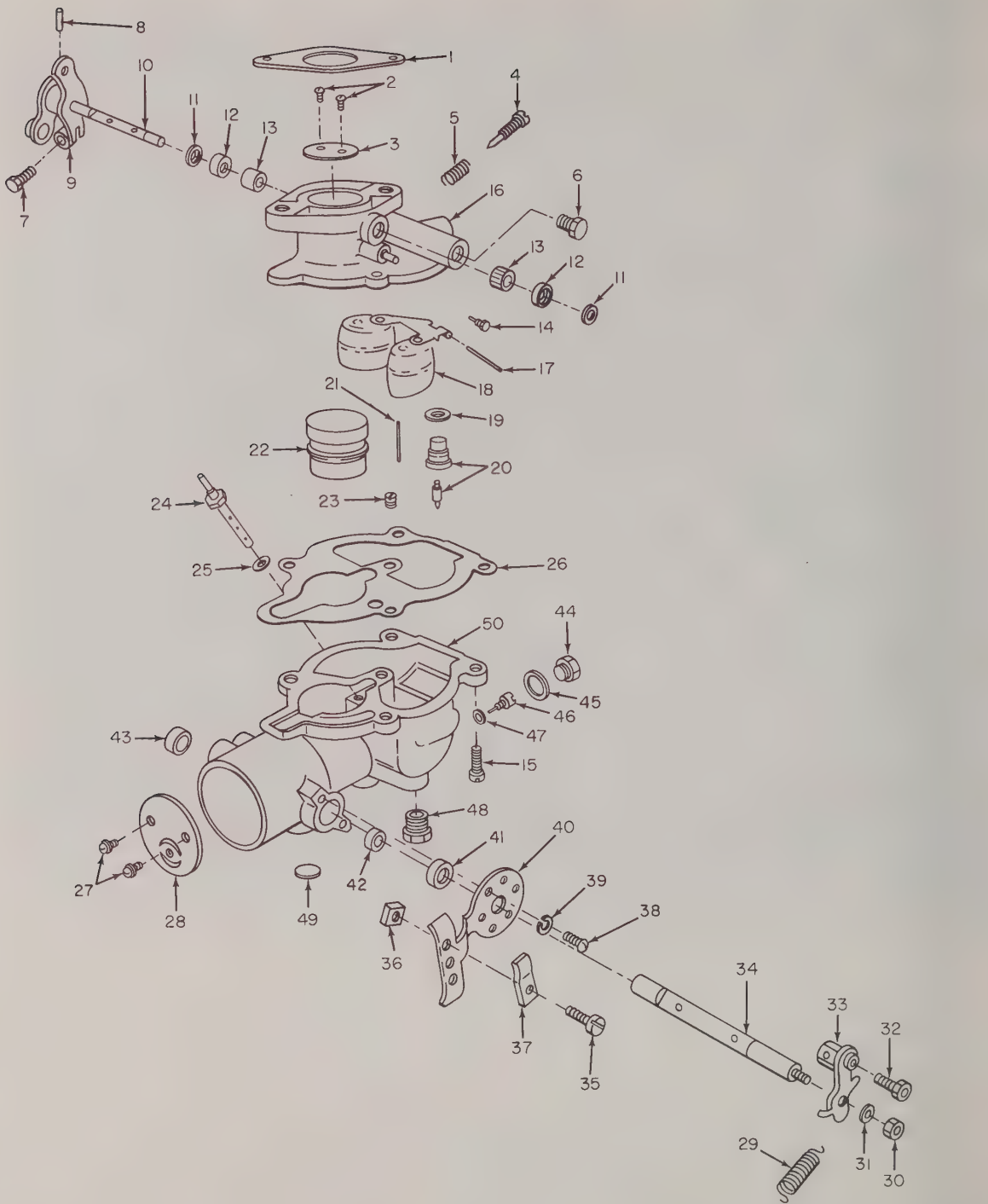


Figure 6–34. Carburetor, exploded view

Figure 6–34—Continued

1 Gasket
2 Throttle plate screw (2)
3 Throttle plate
4 Idle adjusting needle
5 Idle needle spring
6 Fuel inlet plug
7 Throttle stop screw
8 Taper pin
9 Throttle and stop lever
10 Throttle shaft
11 Shaft seal retainer (2)
12 Throttle shaft seal (2)
13 Throttle shaft bushing (2)
14 Idle jet
15 Bowl to body screw (4)
16 Throttle body
17 Float axle
18 Float
19 Seat washer
20 Fuel valve and seat
21 Idle filler tube
22 Venturi
23 Well vent jet
24 Discharge jet
25 Discharge jet washer
26 Body gasket
27 Choke plate screw (2)
28 Choke plate
29 Choke lever return spring
30 Choke shaft nut
31 Choke shaft lock washer
32 Lever swivel screw
33 Choke lever
34 Choke shaft
35 Bracket clip screw
36 Clip screw nut
37 Bracket tube clip
38 Choke bracket screw (2)
39 Choke bracket lock washer (2)
40 Choke bracket
41 Shaft packing retainer
42 Choke shaft packing washer
43 Shaft hole plug
44 Main jet passage plug
45 Passage plug washer
46 Main jet
47 Main jet washer
48 Bowl drain plug
49 Intake drain disc
50 Fuel bowl

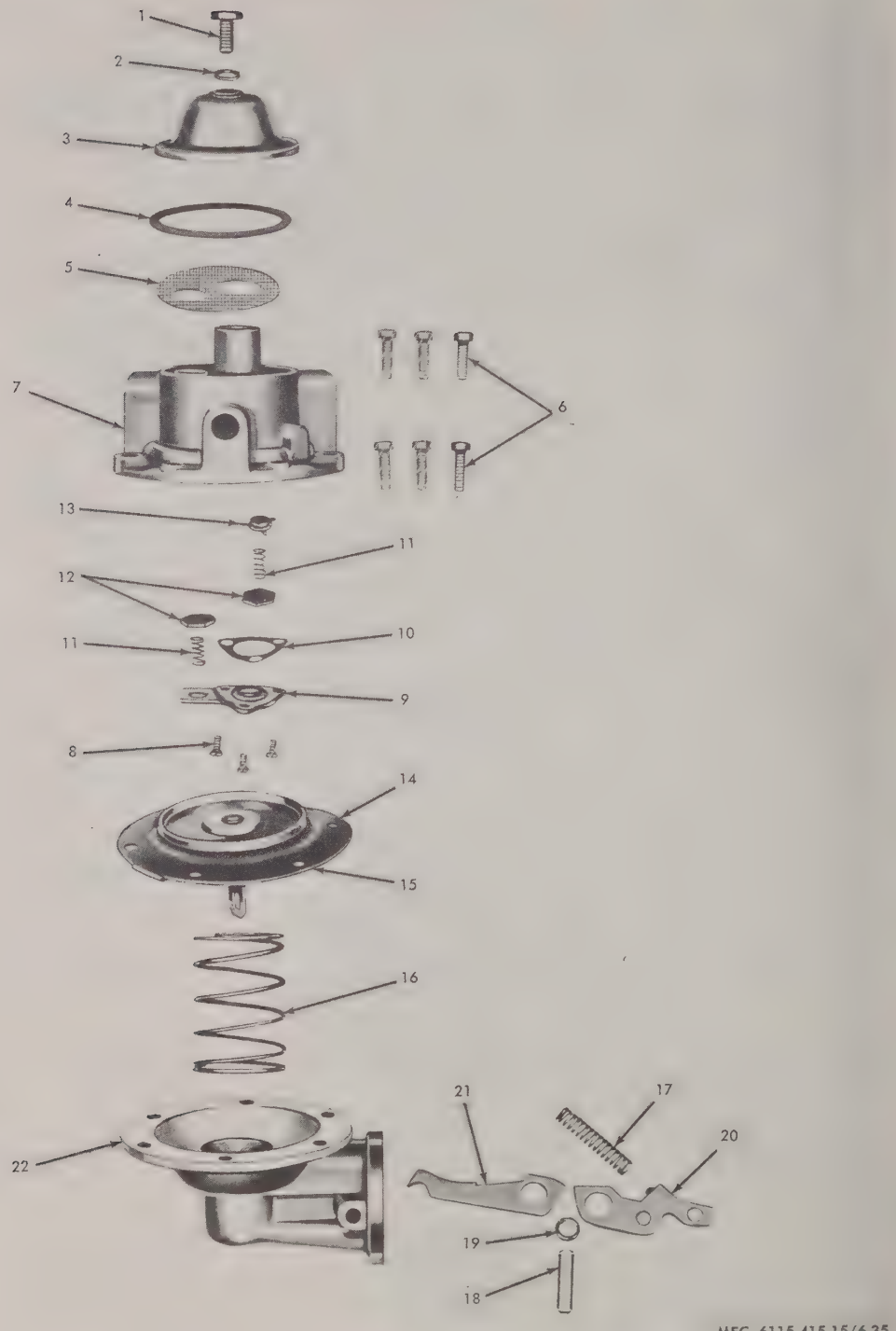


Figure 6–35. Fuel pump, exploded view

Figure 6–35—Continued

1 Pulsator dome bolt
2 Dome bolt gasket
3 Pulsator dome
4 Dome gasket
5 Filter screen
6 Fuel head mounting screw (6)
7 Fuel head
8 Valve plate screw (3)
9 Valve plate
10 Valve plate gasket
11 Valve spring (2)
12 Valve (2)
13 Valve spring retainer
14 Diaphragm
15 Diaphragm gasket
16 Diaphragm spring
17 Rocker arm spring
18 Rocker arm pin
19 Rocker arm bushing
20 Rocker arm
21 Linkage
22 Mounting bracket

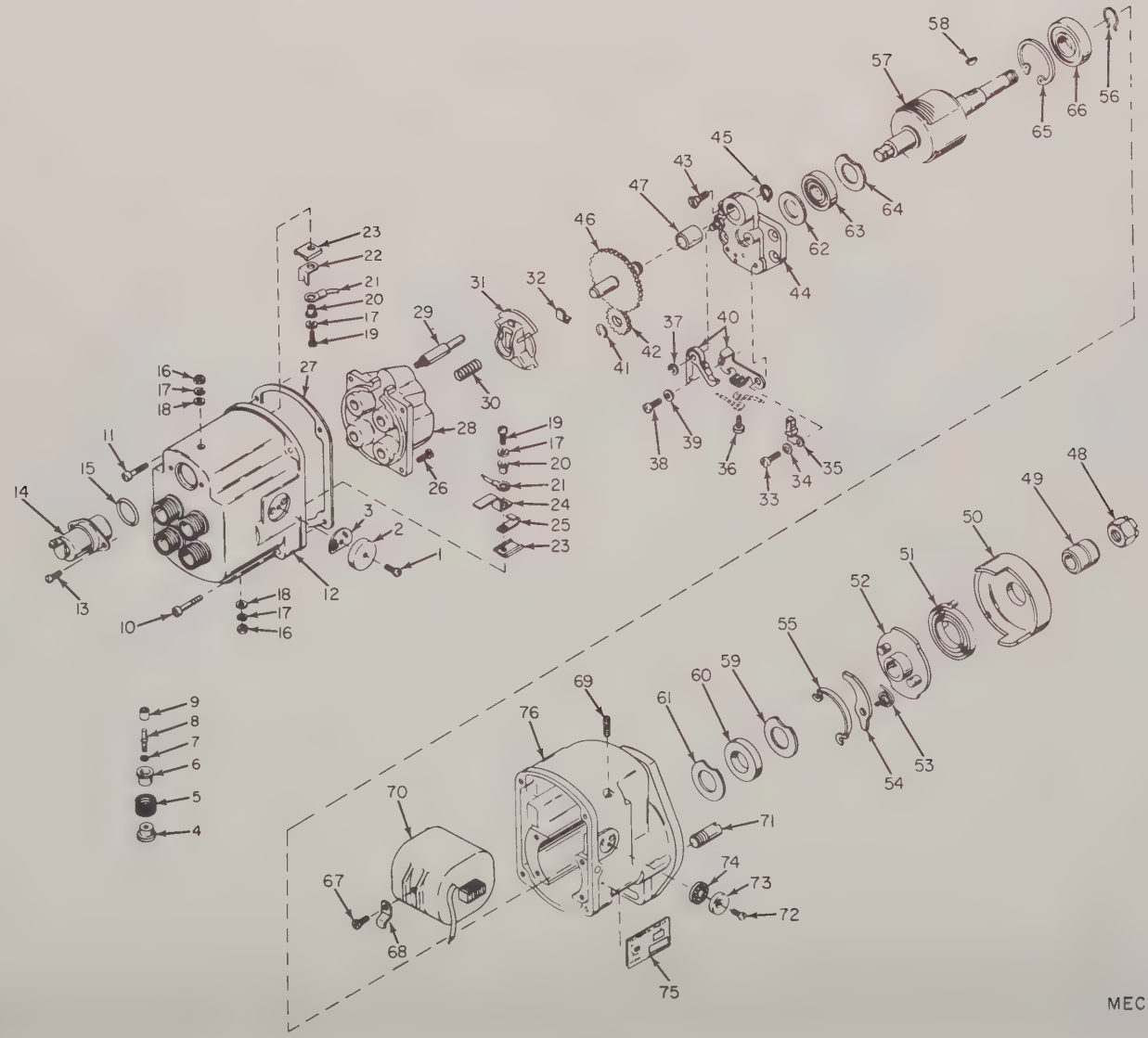


Figure 6-36. Magneto, exploded view

Figure 6–36—Continued

1 Screw, fillister-hd, No. 6–32 x ⅜ in.
2 End cap vent cover
3 End cap vent screen
4 Switch button
5 Switch nut
6 Switch ferrule
7 Switch spring
8 Plunger and nut assembly
9 Spacer
10 Screw, fillister-hd, No. 10–24 x 1⅛ in. (2)
11 Screw, fillister-hd, No. 10–24 x ¾ in. (2)
12 End cap
13 Screw, fillister-hd, No. 6–32 x ⅜ in. (2)
14 Capacitor
15 O-ring gasket
16 Nut, No. 6–32 (2)
17 Washer, lock, No. 6 (4)
18 Washer, flat, No. 6 (2)
19 Screw, fillister-hd, No. 6–32 x ½ in. (2)
20 Bushing (2)
21 Lead assembly (2)
22 Capacitor contact
23 Strip guide (2)
24 Ground to contact support
25 Ground to contact support
26 Screw, fillister-hd, No. 8–32 x ½ in. (4)
27 End cap gasket
28 Distributor block
29 Lead rod
30 Brush and spring
31 Distributor rotor
32 Rotor spring clip
33 Screw, fillister-hd, No. 8–32 x ⅜ in.
34 Washer, flat, No. 8
35 Cam wick
36 Screw, terminal, No. 6–32 x ⅜ in.
37 Retaining ring
38 Screw, support, No. 6–32 x ⅜ in.
39 Washer, flat, No. 6
40 Breaker point set
41 Retaining ring
42 Rotor gear
43 Screw, flat-hd, No. 8–32 x ⅜ in. (4)
44 Bearing support
45 Retaining ring
46 Shaft and gear
47 Distributor bearing
48 Coupling nut
49 Gear bushing
50 Coupling shell
51 Coupling spring
52 Hub assembly
53 Pawl spring (2)
54 Coupling pawl (2)
55 Pawl lock spring
56 Retaining ring
57 Rotor
58 Key
59 Outer seal washer
60 Shaft seal
61 Inner seal washer
62 Outer grease retaining washer
63 Cam end bearing
64 Inner grease retaining washer
65 Retaining ring
66 Drive end bearing
67 Screw, fillister-hd, No. 6–32 x ¼ in.
68 Coil clip
69 Setscrew, 5/16–24 x ⅞ in.
70 Coil
71 Pawl stop pin
72 Screw, cover, No. 6–32 x ¼ in. (2)
73 Housing vent cover
74 Housing vent screen
75 Nameplate
76 Housing

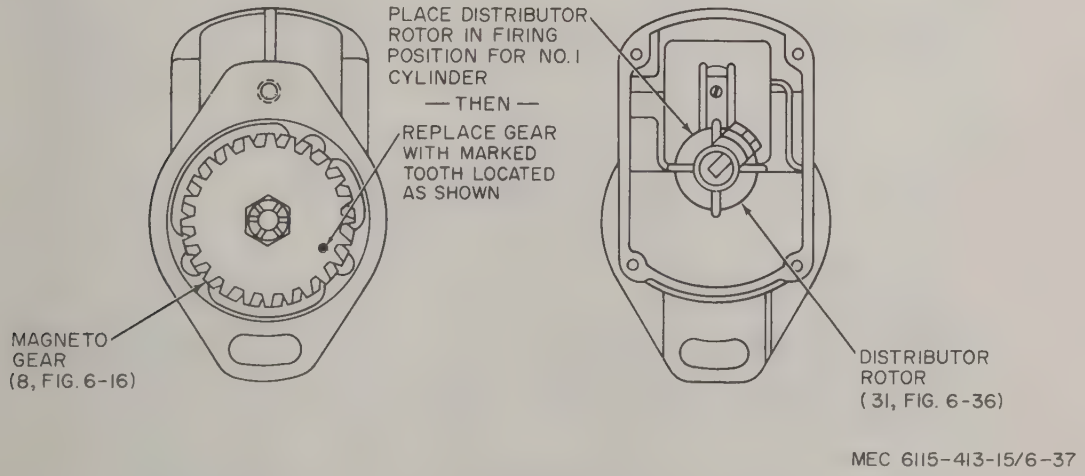

PLACE DISTRIBUTOR ROTOR IN FIRING POSITION FOR NO. 1 CYLINDER
— THEN —
REPLACE GEAR WITH MARKED TOOTH LOCATED AS SHOWN
MAGNETO GEAR (8, FIG. 6-16)
DISTRIBUTOR ROTOR (31, FIG. 6-36)
MEC 6115-413-15/6-37

Figure 6–37. Alignment of magneto gear on magneto

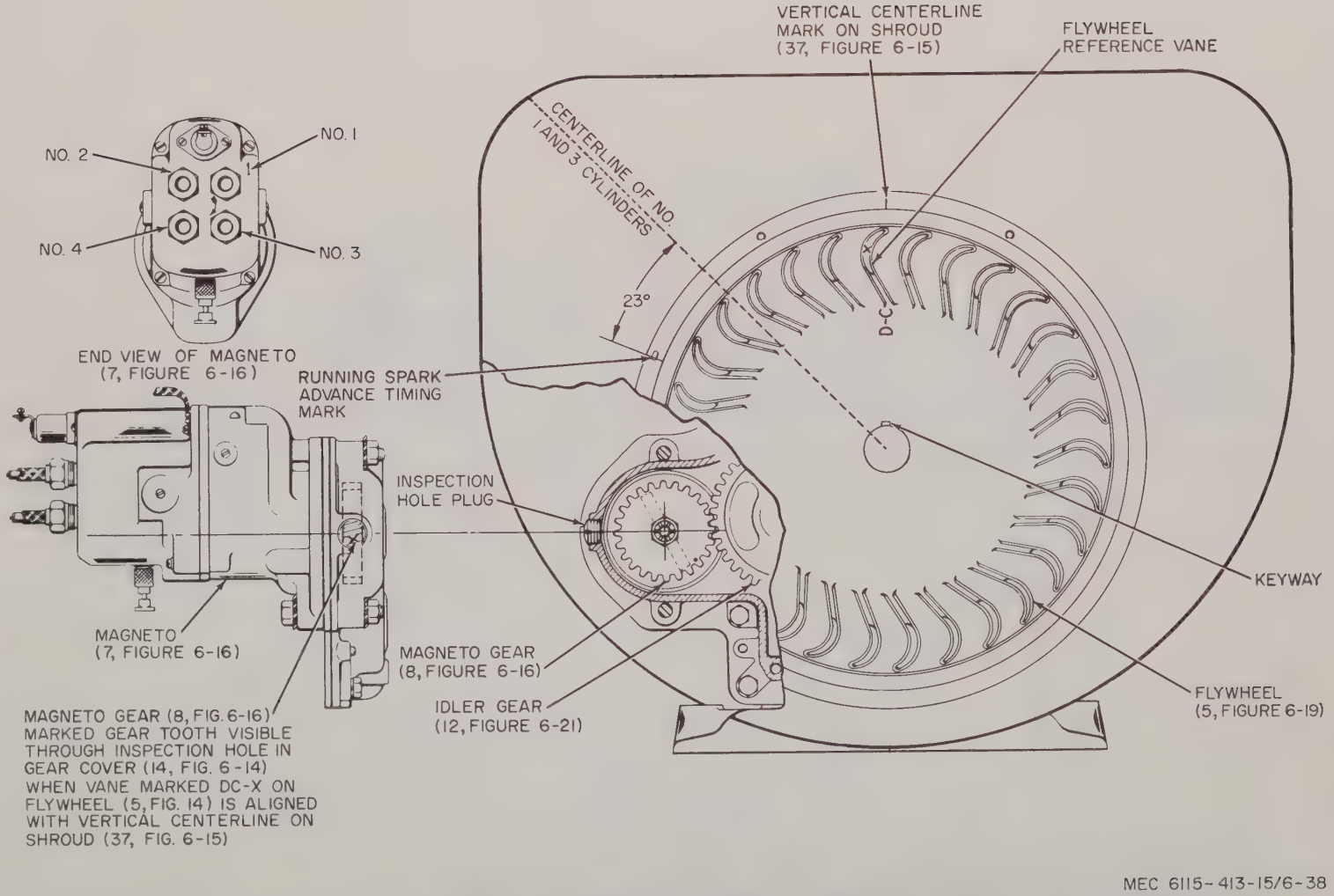


Figure 6–38. Installation and timing of magneto

6–59. Reassembly

Reassembly is the reverse of numerical sequence illustrated on figure 6–40. Before installing roller bearings (70, fig. 6–40) in hub assembly (69), pack the hub 1/3 full with automotive grease (Specification MIL–G–10924).

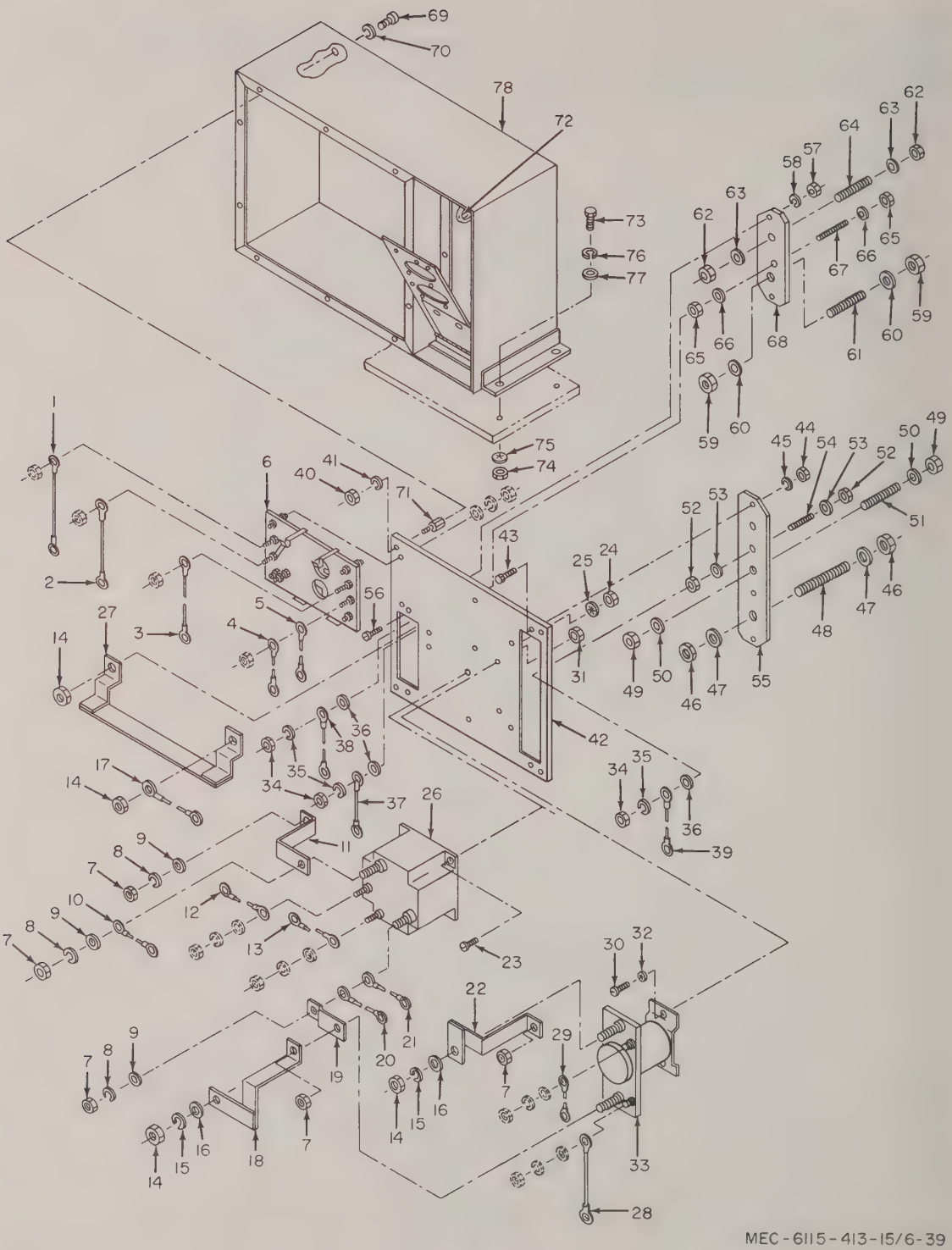


Figure 6–39. Control box assembly, exploded view

Figure 6–39—Continued

1 Lead assembly (Lead No. 1)
2 Lead assembly (Lead No. 2)
3 Lead assembly (Lead No. 6)
4 Lead assembly (Lead No. 4)
5 Lead assembly (Lead No. 5)
6 Voltage regulator base
7 Nut, hex, ⅜–24 (5)
8 Washer, lock, ⅜ in. (3)
9 Washer, flat, ⅜ in. (3)
10 Lead assembly (Lead No. 11)
11 Bus bar
12 Lead assembly (Lead No. 7)
13 Lead assembly (Lead No. 8)
14 Nut, hex, ½–20 (4)
15 Washer, lock, ½ in. (2)
16 Washer, flat, ½ in. (2)
17 Lead assembly (Lead No. 19)
18 Bus bar
19 Bus bar
20 Lead assembly (Lead No. 9)
21 Lead assembly (Lead No. 10)
22 Bus bar
23 Screw, pan-hd, No. 10–32 x ½ in. (4)
24 Nut, hex, No. 10 (4)
25 Washer, lock, internal tooth, No. 10 (4)
26 Reverse current cutout relay (K1)
27 Bus bar
28 Lead assembly (Lead No. 13)
29 Lead assembly (Lead No. 14)
30 Screw, pan-hd, ¼–28 x ½ in. (2)
31 Nut, hex, ¼–28 (2)
32 Washer, Lock, internal tooth, ¼ in. (2)
33 Relay (K2)
34 Nut, hex, No. 10–32 (4)
35 Washer, lock, No. 10 (4 rqr)
36 Washer, flat, No. 10 (4)
37 Lead assembly (Lead No. 3)
38 Lead assembly (Lead No. 12)
39 Lead assembly (Lead No. 17)
40 Nut, hex, No. 10–32 (7)
41 Washer, lock, No. 10 (7)
42 Control panel
43 Screw, pan-hd, No. 10–32 x ⅝ in. (2)
44 Nut, hex, No. 10–32 (2 rqr)
45 Washer, lock, No. 10 (2)
46 Nut, hex, ½–20 (2)
47 Washer, flat, ½ in. (2)
48 Stud, ½–20
49 Nut, hex, ⅜–24 (4)
50 Washer, flat, ⅜ in. (4)
51 Stud, ⅜–24 (2 rqr)
52 Nut, hex, No. 10–32 (4)
53 Washer, flat, No. 10 (4)
54 Stud, No. 10–32 (2)
55 Terminal board (TB1)
56 Screw, pan-hd, No. 10–32 x ⅝ in. (2)
57 Nut, hex, No. 10–32 (2)
58 Washer, lock, No. 10 (2)
59 Nut, hex, ½–20 (2)
60 Washer, flat, ½ in. (2)
61 Stud, ½–20
62 Nut, hex, ⅜–24 (2)
63 Washer, flat, ⅜ in. (2)
64 Stud, ⅜–24
65 Nut, hex, No. 10–32 (4)
66 Washer, flat, No. 10 (4)
67 Stud, No. 10–32 (2)
68 Terminal board (TB2)
69 Screw, pan-hd, No. 10–32 x ½ in. (7)
70 Washer, lock, No. 10 (7)
71 Standoff (7)
72 Grommet
73 Screw, cap, hex-hd, ¼–20 x ⅞ in. (4)
74 Nut, hex, ¼–20 (4)
75 Washer, lock, internal tooth, ¼ in. (2)
76 Washer, lock, ¼ in. (3)
77 Washer, flat, ¼ in. (3)
78 Control box subassembly

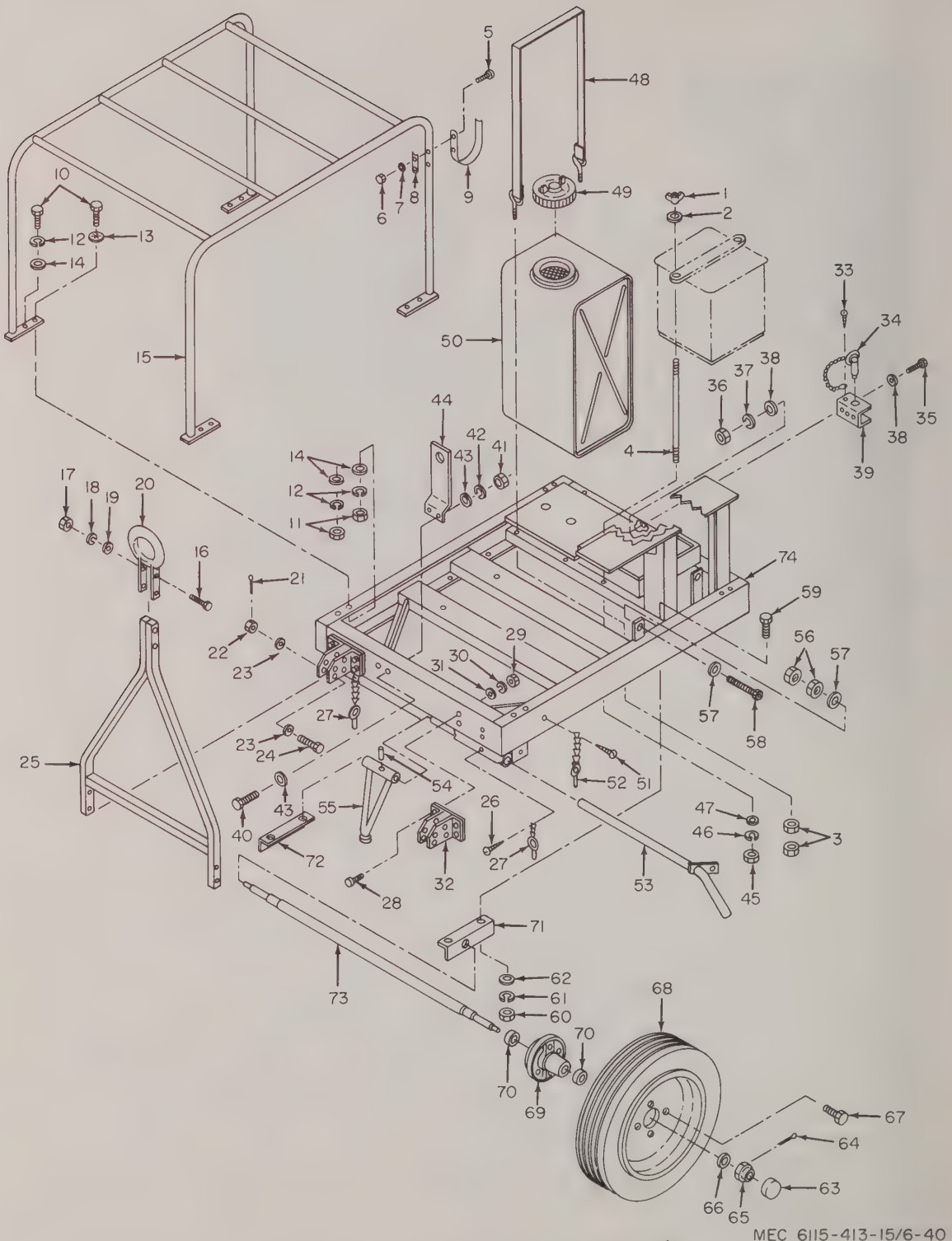


Figure 6–40. Frame and chassis, exploded view

Figure 6–40—Continued

1 Wing nut (2)
2 Washer, flat, ¼ in. (2)
3 Nut, hex, ¼–20 (4)
4 Battery clamp (2)
5 Screw, pan-hd, No. 10–32 x 1¾ in. (4)
6 Nut, hex, No. 10–32 (4)
7 Washer, flat, No. 10
8 Cable clamp (2)
9 Cable bracket (2)
10 Screw, cap, hex-hd, 5/16–18 x 1⅛ in. (8)
11 Nut, hex, 5/16–18 (8)
12 Washer, lock, 5/16 in. (14)
13 Washer, lock, internal tooth, 5/16 in. (2)
14 Washer, flat, 5/16 in. (14)
15 Tubular frame
16 Screw, cap, hex-hd, ⅜–16 x 3¼ in. (2)
17 Nut, hex, ⅜ in. (2)
18 Washer, lock, ⅜ in. (2)
19 Washer, flat, ⅜ in. (2)
20 Drawbar coupler
21 Cotter pin (2)
22 Nut, castellated, ½–20 (2)
23 Washer, flat, ½ in. (4)
24 Bolt, hex-hd, ½–20 x 2 19/32 in. (2)
25 Tow bar
26 Screw, self-tapping, recessed-hd, No. 8–18 x ½ in. (2)
27 Quick release pin (2)
28 Screw, cap, hex-hd, ⅜–16 x 1½ in. (8)
29 Nut, hex, ⅜–16 (8)
30 Washer, lock, ⅜ in. (8)
31 Washer, flat, ⅜ in. (8)
32 Tow bar bracket (2)
33 Screw, self-tapping, recessed-hd, No. 8–18 x ½ in.
34 Pintle pin assembly
35 Screw, cap, hex-hd, ¼–20 x 1¼ in. (3)
36 Nut, hex, ¼–20
37 Washer, lock, ¼ in. (3)
38 Washer, flat, ¼ in. (6)
39 Pintle bracket
40 Screw, cap, hex-hd, ¼–20 x ⅞ in. (2)
41 Nut, hex, ¼–20 (2)
42 Washer, lock, ¼ in. (2)
43 Washer, flat, ¼ in. (4)
44 Crank bracket
45 Nut, hex, 5/16–24 (4)
46 Washer, lock, 5/16 in. (4)
47 Washer, flat, 5/16 in. (4)
48 Fuel tank strap assembly
49 Fuel tank filler cap
50 Fuel tank assembly
51 Screw, self-tapping, recessed-hd, No. 8–18 x ½ in.
52 Quick release pin
53 Stand handle
54 Spring pin
55 Vehicular stand
56 Nut, hex, ½–13 (2)
57 Washer, flat, ½ in. (2)
58 Generator adjusting screw
59 Screw, cap, hex-hd, ⅜–16 x 1½ in. (4)
60 Nut, hex, ⅜–16 (4)
61 Washer, lock, ⅜ in. (4)
62 Washer, flat, ⅜ in. (4)
63 Cap (2)
64 Cotter pin (2)
65 Nut, castellated, ¾–20 (2)
66 Keyed washer (2)
67 Automotive bolt (supplied with hub assembly) (8)
68 Wheel and tire assembly (2)
69 Hub assembly (2)
70 Roller bearing (supplied with hub assembly) (4)
71 Right-hand axle bracket
72 Left-hand axle bracket
73 Axle
74 Chassis

APPENDIX A

REFERENCES

A–1. Fire Protection

TB 5–4200–200–10	Supply of DA Approved Fire Extinguishers to Army Troop Users.
TM 5–687	Repair and Utilities: Fire Protection Equipment and Appliances: Inspections, Operations, and Preventive Maintenance.

A–2. Painting

TM 9–213	Painting instructions for Field Use.

A–3. Preventive Maintenance

TM 5–764	Electric Motor and Generator Repair.
TM 9–6140–200–15	Operation and Organizational, Field and Depot Maintenance: Storage Batteries, Lead Acid Type.
TM 38–750	Army Equipment Record Procedures.

A–4. Shipment and Limited Storage

AR 743–505	Limited Storage of Corps and Engineers Equipment.

A–5. Supply Publications

C9100–IL	Petroleum, Petroleum Base Products and Related Material.

A–6. Training Aids

FM 5–25	Explosives and Demolitions.

APPENDIX B

BASIC ISSUE ITEMS LIST AND MAINTENANCE AND OPERATING SUPPLIES

Section I. INTRODUCTION

B–1. General

Section II lists the accessories, tools, and publications required for maintenance and operation by the operator which are initially issued with, or authorized for use with the generator set. Section III lists the maintenance and operating supplies required for initial operation.

B–2. Explanation of Columns Contained in Section II

a. Source Codes. The information provided in each column is as follows:

(1) *Material.* This column is left blank. For identification of agencies assigned supply responsibility for parts, refer to appropriate Federal and Department of Army supply catalogs.

(2) *Source.* The selection status and source of supply for each part are indicated by one of the following code symbols:

(*a*) P—Applied to repair parts which are stocked in, or supplied from the GSA/DSA, or Army supply system, and authorized for use at indicated maintenance categories.

(*b*) M—Applied to repair parts which are not procured or stocked but are to be manufactured at indicated maintenance categories.

(*c*) A—Applied to assemblies which are not procured or stocked as such, but are made up of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked and can be assembled by units at indicated maintenance categories.

(*d*) X—Applied to parts and assemblies which are not procured or stocked; the mortality of which normally is below that of the applicable end item; and the failure of which should result in retirement of the end item from the supply system.

(*e*) X1—Applied to repair parts which are not procured or stocked, the requirement for which will be supplied by use of next higher assembly or component.

(*f*) X2—Applied to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain through cannibalization; if not obtained through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.

(*g*) C—Applied to repair parts authorized for local procurement. If not obtainable from local procurement, such repair parts will be requisitioned through normal supply channels with a supporting statement of nonavailability from local procurement.

(*h*) G—Applied to major assemblies that are procured with PEMA funds for initial issue only to be used as exchange assemblies at DSU or GSU level. These assemblies will not be stocked above DSU

and GSU level or returned to depot supply level.

(3) *Maintenance.* The lowest maintenance level authorized to use, stock, install, or manufacture the part is indicated by the following code symbol:

O—Organizational Maintenance

(4) *Recoverability.* Repair parts and/or tool and equipment items that are recoverable are indicated by one of the following code symbols:

(*a*) R—applied to repair parts and assemblies which are economically repairable at direct and general support maintenance activities and normally are furnished by supply on an exchange basis.

(*b*) T—applied to high-dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance facilities.

(*c*) U—applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high-dollar value reusable casings, castings, and the like.

Note. When no code is shown in the recoverability column the part is considered expendable.

b. Federal Stock Number. When a Federal stock number is available for a part, it will be shown in this column, and will be used for requisitioning purposes.

c. Description.

(1) The item name and a brief description of the part are shown.

(2) A five-digit Federal supply code for manufacturers and/or other supply services is shown in parentheses followed by the manufacturer's part number. This number shall be used for requisitioning purposes when no Federal stock number is indicated in the Federal stock number column. Example: (08645) 86453

d. Unit of Issue. If no abbreviation is shown in this column, the unit of issue is "each".

e. Quantity Authorized. This column lists the quantities of repair parts, accessories, tools, or publications authorized for issue to the equipment operator or crew as required.

f. Quantity Issued with Equipment. This column lists the quantities of repair parts, accessories, tools, or publications that are initially issued with each item of equipment. Those indicated by an asterisk are to be requisitioned through normal supply channels as required.

g. Illustrations. This column is subdivided into two columns which provide the following information:

(1) *Figure number.* Provides the identifying number of the illustration.

(2) *Item number.* Provides the referenced number for the parts shown in the illustration.

B–3. Explanation of Columns Contained in Section III

a. Item. This column contains numerical sequenced item numbers, assigned to each component application, to facilitate reference.

b. Component Application. This column identifies the component application of each maintenance or operating supply item.

c. Source of Supply. This column is left blank. For identification of agencies assigned supply responsibility for parts, refer to appropriate Federal and Department of Army supply catalogs.

d. Federal Stock Number. The Federal stock number will be shown in this column and will be used for requisitioning purposes.

e. Description. The item and a brief description are shown.

f. Quantity Required for Initial Operation. This column lists the quantity of each maintenance or operating supply item required for initial operation of the equipment.

g. Quantity Required for 8 Hours Operation. Quantities listed represent the estimated requirements for an average eight hours of operation.

h. Notes. This column contains informative notes keyed to data appearing in the preceding column.

Section II. BASIC ISSUE ITEMS LIST

Source Codes				Federal Stock Number	Description	Unit of Issue	Quantity Authorized	Quantity Issued with Equipment	Illustration	
Materiel	Source	Maintenance	Recoverability						Fig	Item
					Group 31 Basic Issue Items, Manufacturer Installed					
					3100—Basic Issue Items, Manufacturer or Depot Installed					
	P	O		7820–559–9618	Case, Maintenance and Operational Manuals; Cotton Duck, Water Repellent, Mildew Resistant (GE)	ea	1	1		
					Department of the Army Lubrication Order LO 5–6115–351–15	ea	1	1		
					Department of the Army Maintenance Manual TM 5–6115–413–15	ea	1	1		
	P	O		6150–240–4411	Cable Assembly, Power, Electrical	ea	1	1		

made commensurate with test procedures and with calibrated tools and/or test equipment referenced in the MAC.

G—REPLACE:
Substitute serviceable components, assemblies and subassemblies for unserviceable counterparts or remove and install the same item when required for the performance of other maintenance operations.

H—REPAIR:
Restore to a serviceable condition by replacing unserviceable parts or by any other action required using available tools, equipment and skills—to include welding, grinding, riveting, straightening, adjusting and facing.

I—OVERHAUL:
Restore an item to a completely serviceable condition (as prescribed by serviceability standards developed and published by the commodity commands) by employing techniques of "Inspect and Repair Only as Necessary" (IROAN). Maximum use of diagnostic and test equipment is combined with minimum disassembly during overhaul. "Overhaul" may be assigned to any level of maintenance except organizational, provided the time, tools, equipment, repair parts authorization, and technical skills are available at that level. Normally, overhaul as applied to end items, is limited to depot maintenance level.

J—REBUILD:
Restore to a condition comparable to new by disassembling to determine the condition of each component part and reassembling using serviceable, rebuilt, or new assemblies, subassemblies, and parts.

e. Reference Note. This column, subdivided into columns K and L, is provided for referencing the Special Tool and Test Equipment Requirements (Section III) and Remarks (Section IV) that may be associated with maintenance operations (Section II).

C–3. Explanation of Columns in Section III

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T and TE requirements column on the MAC. The letter represents the specific maintenance operation the item is to be used with. The letter is representative of columns A through J on the MAC.

b. Maintenance Level. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal stock number, of tools and test equipment.

C–4. Explanation of Columns in Section IV

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column L and the second letter references a maintenance operation, column A through J.

b. Remarks. This column lists information pertinent to the maintenance operation being performed, as indicated on the MAC Section II.

Section II. MAINTENANCE ALLOCATION CHART

Functional group number	Component assembly nomenclature	Essentiality	Maintenance operations / Maintenance levels										Note ref	
			A	B	C	D	E	F	G	H	I	J	K	L
			Service	Adjust	Aline	Calibrate	Inspect	Test	Replace	Repair	Overhaul	Rebuild	T&TE Rqmt	Remarks
01	ENGINE													
0100	Engine Assembly:													
	Engine gasoline		O/C				O/C	O	DS	DS	GS			A–F

Section II. MAINTENANCE ALLOCATION CHART (Continued)

Functional group number	Component assembly nomenclature	Essentiality	Maintenance operations / Maintenance levels: A Service	B Adjust	C Aline	D Calibrate	E Inspect	F Test	G Replace	H Repair	I Overhaul	J Rebuild	Note ref: K T&TE Rqmt	L Remarks
0101	Crankcase, Block, Cylinder Head:													
	Block, with valve guides								GS	GS				
	Crankcase assembly								GS	GS				
	Head assembly, cylinder								DS	DS				
0102	Crankshaft:													
	Crankshaft assembly								GS	D				B–H
	Bearing set								GS					
	Pulley, engine								DS					
0104	Pistons, Connecting Rods:													
	Piston								GS					
	Rod assembly								GS					
0105	Valves, Camshafts and Timing Systems:													
	Guide								DS					
	Seat, valve spring								DS					
	Spring, valve							DS	DS					
	Valves								DS	GS				D–H
	Tappet, valve lifting			O					GS					
	Camshaft								GS					
	Bearing set								GS					
	Gears, timing								GS					
0106	Engine Lubrication System:													
	Pump assembly								DS	DS				
	Oil pan assembly								DS	DS				S–B
0107	Starter Device:													
	Starter, hand cranking								O	O				
0108	Manifolds:													
	Manifolds								O					
03	FUEL SYSTEMS													
0301	Carburetor:													
	Carburetor assembly			O					O	DS	DS			I–H
0302	Fuel Pump:													
	Pump assembly		O					O	O	DS				I–H
0304	Air Cleaner:													
	Air cleaner assembly		O/C						O					
0305	Tanks, Lines, Fittings:													
	Tank assembly		O/C						O	DS				
	Line assembly, fuel								O					
0308	Engine Speed Governor:													
	Governor assembly			DS				DS	DS	GS				
0312	Throttle and choke controls								O					

Section II. MAINTENANCE ALLOCATION CHART (Continued)

Functional group number	Component assembly nomenclature	Essentiality	Maintenance operations / Maintenance levels: A Service	B Adjust	C Aline	D Calibrate	E Inspect	F Test	G Replace	H Repair	I Overhaul	J Rebuild	Note ref: K T&TE Rqmt	L Remarks
04	EXHAUST SYSTEM:													
0401	Muffler:								O					
	Exhaust deflector								O					
05	COOLING SYSTEM													
0501	Shutter:													
	Shutter assembly		O/C						O	GS				O–F
	Thermostat								O					
06	ELECTRICAL SYSTEM													
0605	Magneto:													
	Cable, spark plugs								O					
	Magneto assembly		O/C	O			O	DS	O	DS				I–H
	Spark plugs		O/C	O/C					O					
13	WHEELS AND TRACKS													
1311	Wheel Assembly		O/C						O	O				
15	FRAME													
1501	Frame assembly								DS	DS				T–H
22	MISCELLANEOUS ACCESSORY ITEMS													
2210	Data Plates:													
	Plate, data (C.O.E.)								O					
	Plate, data and instruction								O					
40	ELECTRIC GENERATORS													
4000	Generator Assembly:													
	Generator assembly		O/C	O			O	DS	DS	DS	GS			R–H
4003	Brush Holders:													
	Holder assembly								GS					
4004	Ventilating System:													
	Fan assembly			O					O	DS				
4007	Drive Components:													
	Belt, drive	E		O					O					
	Pulley, drive								DS					
4009	Control Panels:													
	Box assemblies, control								DS	DS				
	Harness, wiring								DS					
	Voltmeter								O					
4012	Switches:													
	Switches, toggle								O					
4013	Regulator, Voltage:													
	Regulator assembly			O/C				DS	O					
4014	Resistors:													
	Resistors, fixed	E						DS	DS					
4015	Relay or Assembly:													
	Relay, reverse current							DS	DS					

Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference code	Maintenance level	Nomenclature	Tool number
	No special tools or equipment required.		

Section IV. REMARKS

Reference code	Remarks
A—F	Test includes engine operation and compression.
B—H	Rebuild of crankshaft includes metalizing, alining, and regrinding.
C—G	Replace ring gear.
D—H	Repair of valves includes refacing.
E—G	Fabricate.
F—F	Bench test.
G—G	Fabricate.
H—G	Fabricate.
I—H	Install kit.
J—H	Install kit.
K—G	Fabricate.
L—H	Install kit.
M—G	Fabricate.
N—H	Fabricate.
O—F	Bench test.
P—J	Rewind.
Q—J	Rewind.
R—H	Replace brushes.
S—B	Adjust valves cold.
T—H	Welding.
U—A	Cleaning and adjusting.

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For explanation of abbreviations used, see AR 320–50.

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